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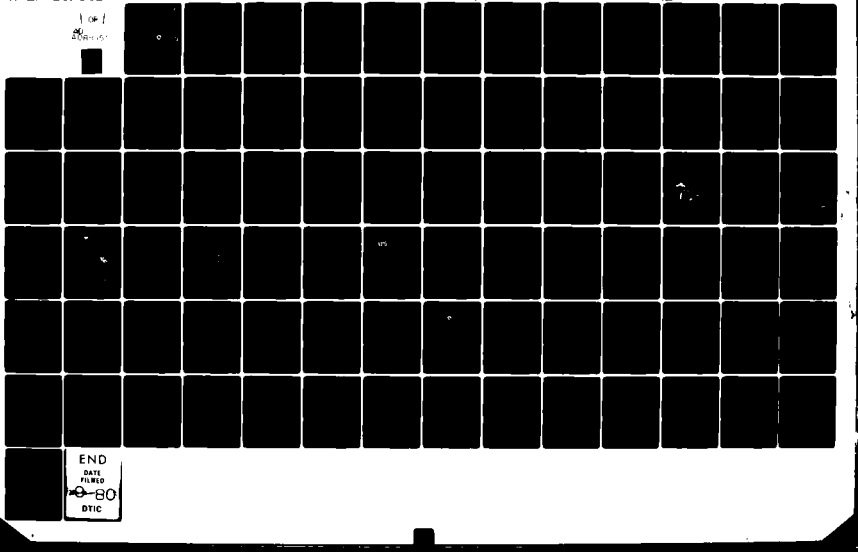

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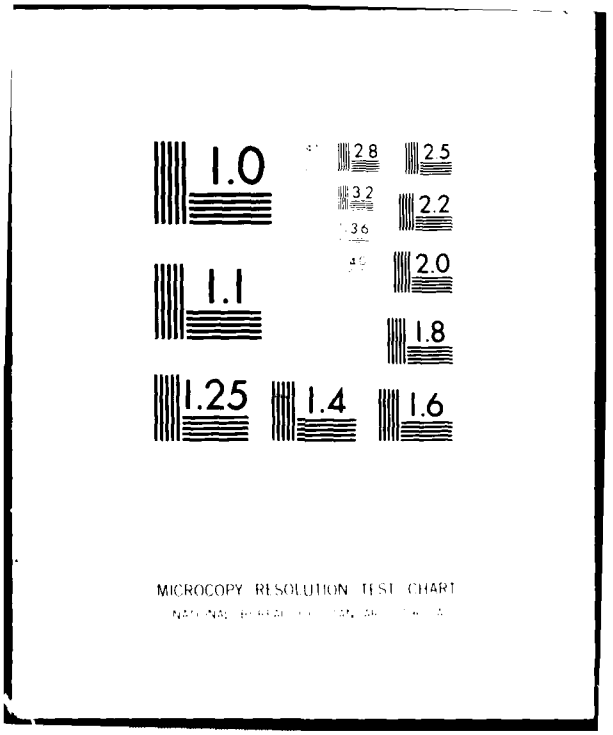
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Report No. FAA-RD-80-80

LEVEL

HELICOPTER NORTHEAST CORRIDOR OPERATIONAL TEST SUPPORT

Helicopter Association of America
Washington, D.C. 20005

JUNE 1980
FINAL REPORT

Prepared for

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
Systems Research & Development Service
Washington, D.C. 20590

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15. Supplementary Notes: The Helicopter Northeast Corridor Evaluation was conducted by the Helicopter Systems Branch of the Navigation and Landing Division under the direction of Raymond J. Hilton, Program Manager. This report and a companion report from the FAA Technical Center entitled "Northeast Corridor Operational User Evaluation", RD 80-17, reflect the results of the evaluation.

16. Abstract

With the growing importance of helicopters to the national air transportation system, a demand is developing for more IFR (virtually all-weather) helicopter capability. At the same time, it is essential that helicopters be able to take advantage of their unique features and operate within the common ATC system without conflict to or from conventional fixed wing air traffic. A "test bed" operation was established progressively by the FAA in cooperation with the HAA during the period 1975-1978 to develop real world applications of these and other helicopter operational concepts in the Northeast Corridor (NEC) of the United States. During mid-1979 to early 1980 a nine month controlled NEC test and evaluation project was carried out jointly by the HAA and the FAA. This HAA report describes the methodology and procedures followed, results obtained during the controlled test period, and conclusions and recommendations reached. The complementary FAA Technical Center report referred to in item 15 above will be issued separately.

17. Key Words	18. Distribution Statement
Helicopter Radar tracking; Northeast Corridor (NEC); area navigation (RNAV); Flight Technical Error (FTE); In-flight/Post-flight data logs; Point-in-Space (PIS); HSVFR	Document is available to U. S. public through the National Technical Information Service, Springfield, VA 22161.

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Unclassified	Unclassified	76	

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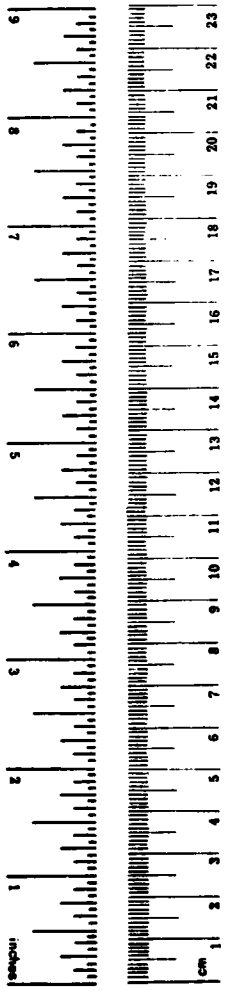
METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

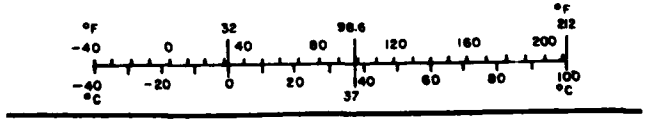
Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
	inches	*2.5	centimeters	cm
	feet	30	centimeters	cm
	yards	0.9	meters	m
	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F

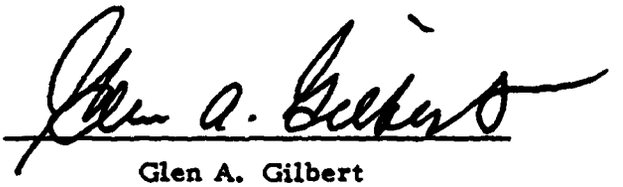


PROJECT PLAN

This project was performed by the Helicopter Association of America under contract to the Federal Aviation Administration as a non-profit effort. Although limited to a specific geographic area (the Northeast Corridor of the United States), it is hoped that the results of the project will have useful applications on a national basis.

The report which follows describes the project plan, including its concept, execution and results.

Prepared by:



Glen A. Gilbert
HAA Project Manager

Approved by:

Robert A. Richardson
HAA Executive Director

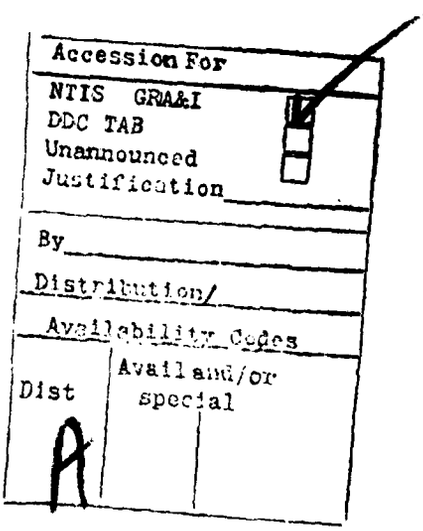


TABLE OF CONTENTS

APPENDICES

ACKNOWLEDGMENTS

In the conduct of the Helicopter Northeast Corridor Operational Test project, numerous meetings were held by the HAA Project Manager with helicopter operators and manufacturers, as well as with FAA personnel interested in helicopter operations along the Northeast Corridor (Boston-Washington). Participation included meetings with such industry groups as the Eastern Region Helicopter Council (ERHC) and the New England Helicopter Operators' Association (NEHOA). Also with FAA New England and Eastern Regional offices and field Air Traffic and Flight Operations personnel. Meetings and close liaison were maintained with FAA personnel at the FAA Technical Center (formerly NAFEC) concerned with this project, particularly Mr. Robert Pursel and Mr. Joseph Harrigan. Frequent consultations also were conducted with Mr. Raymond Hilton, FAA COTR for this project, as well as with Mr. J. R. Nelson, Chief of FAA's Helicopter Program Office, and others of his staff.

Special recognition is given to the pilots who participated in this project. It should be understood that all of the flights covered by this report were conducted during the course of regular, normal business operations. The results of this project, therefore, are symptomatic of the real world of civil helicopter flying.

Acknowledgment also is extended to the many controllers who were involved. Their handling of the flights covered by the report was conducted during normal ATC operations.

A preliminary draft of the companion report to this report being issued by the FAA Technical Center was reviewed by the HAA Project Manager. Certain conclusions in the FAA report are based on tracking data contained in the Technical Center's report, but essentially it has been the intent to make the two reports complementary and not duplicatory.

Glen A. Gilbert
HAA Project Manager

INTRODUCTION

Civil benefits from the use of rotorcraft have been very significant since 1960 and will grow in the future as technology advances to keep pace with needs. These needs have resulted in strong growth rates of helicopter fleets, heliports/helipads (mainly privately owned) and operators, with some years seeing growth rates of 10 - 18%. All indications are that there will continue to be significant technology advances in the future, and that the strong growth and benefits pattern will continue.

Present helicopter designs have incorporated impressive improvements in performance, reliability, quietness, and vibration reduction over previous designs. For the first time, helicopters have been specifically designed for the civil markets and for civil environments and there will be increased near-term use of these rotorcraft in air transportation. This present level of rotorcraft technology, having emerged during the 60's and 70's will grow significantly during the decade of the 1980's.

Future directions in the development of civil helicopter applications are in the fields of:

- AIR TRANSPORTATION
- FORESTRY PROTECTION/MANAGEMENT
- AGRICULTURE
- RESOURCES EXPLORATION/DEVELOPMENT
- CONSTRUCTION
- PUBLIC SERVICE AND RESCUE
- CARGO DISTRIBUTION

In the future, the helicopter will grow in value as a tool to permit industry to move out of high cost areas into areas where facilities investment and overhead and land costs are lower, and still maintain key management and customer services. Helicopter air taxi and business/corporate operations will grow to serve these special transportation needs. Benefits in time savings, congestion relief, improved urban transportation and more efficient use of available real estate can result by shifting toward heliports and

away from the more land intensive transportation systems. Figure 1 illustrates these general concepts.

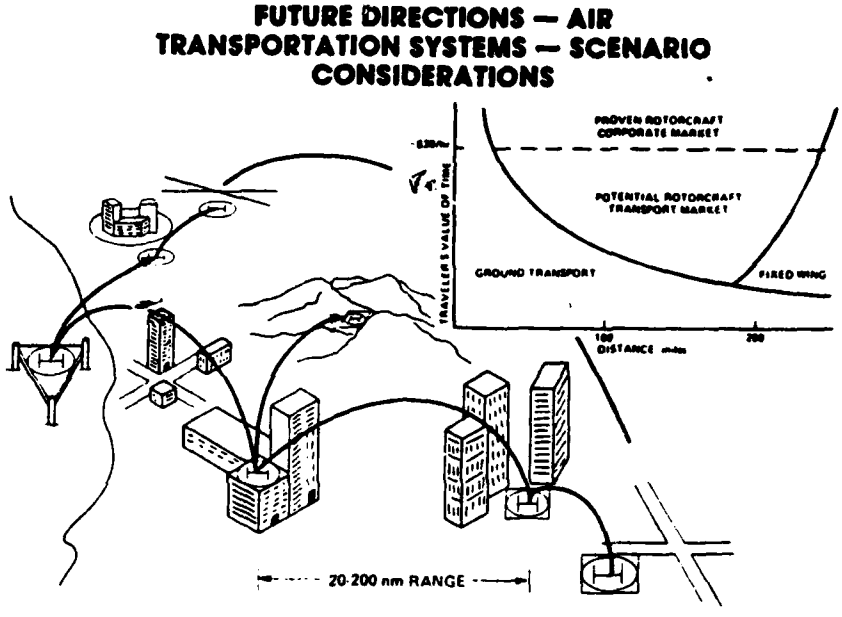


Figure 1 .

These and other relevant factors lead to the following forecasts:

• The total U.S. civil helicopter fleet is expected to total some 20,000 by 1990 at an annual growth rate of about 12-15%.

• During this same period, business/corporate operators are expected to exceed 4,000 and commercial helicopters are expected to reach some 10,000 with around 3,000 operators.

• By the end of the eighties, at least 50% of the combined business/corporate and commercial helicopters in the U.S. will have IFR (instrument flight rules) capability, or well over 7,000 helicopters.

• Basic motivations which will encourage moving more and more into IFR helicopter capability include:

- Simplified government IFR certification criteria;
- Improved safety of operations;

- Increased vehicle productivity;
- Need for increased short haul helicopter "all-weather" service;
- Growing recognition by helicopter operators of the economic benefits of IFR capability.

• New technology in the generation of helicopters specifically designed for civil use will be seen in the 80's. Other new and advanced technological developments will continue to stimulate helicopter/VTOL growth.

Figures 2 and 3 show actual (1960 - 1978) growth of helicopters and copter operators in the United States. Projections are made for the period 1978 - 1990 based on past trends and future planning of U.S. helicopter manufacturers.

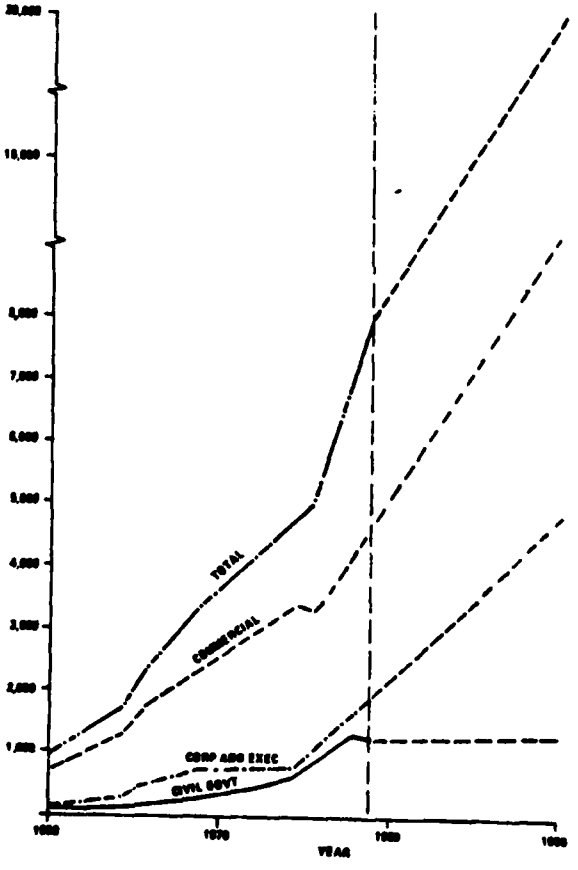


Figure 2

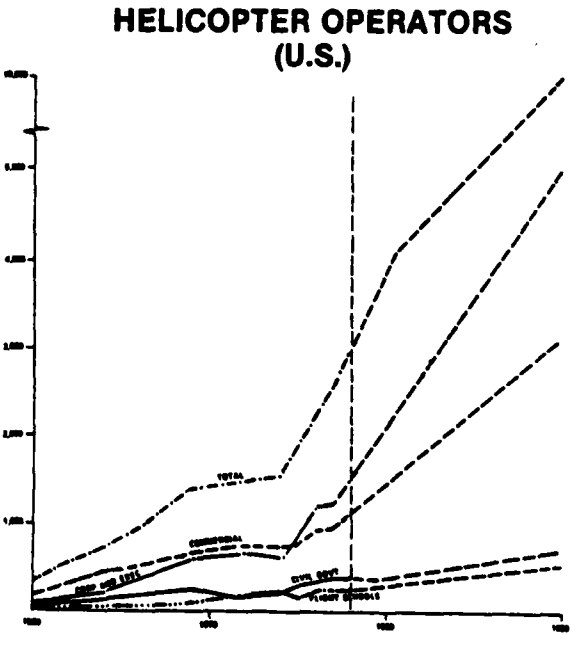


Figure 3

WORLDWIDE HELICOPTER DELIVERIES 1969-1978
Dividing line between two weight classes: 14,000 lb gross weight.

Class	Light / intermediate	Medium / heavy
Military	13,400	1946
Civil	7,085	216
Total	*20,485*	*2162*

WORLDWIDE HELICOPTER FLYAWAY VALUE 1969-1978
In millions of 1979 dollars. Dividing line between two weight classes: 14,000 lb gross weight.

Class	Light / intermediate	Medium / heavy
Military	5104	4841
Civil	2491	535
Total	*7595*	*5376*

Figure 4

During the ten year period 1969-1978 the U. S. helicopter industry produced approximately 22, 000 civil and military helicopters, with civil helicopters accounting for about 7, 300. At an expected 12-15% annual growth rate during the 80's, the forecast (Figure 2) for the decade should be quite conservative. Note also the impressive contribution of the helicopter industry to the GNP. (see Figure 4.)

Current civil uses of helicopters in the U. S. and Canada show a predominent application of small helicopters for corporate, charter, aerial applications and public safety. Medium/ heavy helicopters are used predominently for off-shore, external load and utility missions.

COMMERCIAL USES OF SMALL AND MEDIUM HELICOPTERS
U.S. and Canada. Expressed in percent.

Use	Small helicopters	Medium helicopters
Personnel transportation		
Corporate	23.5	1.5
Charter air taxi	22.5	—
Charter off shore	5.5	21.0
Scheduled carriers	—	3.0
Industrial support		
External load	1.0	20.0
Utility missions	5.0	48.0
Aerial applications (agriculture, forestry, etc.)	19.0	2.5
Public safety (police, fire fighting, etc.)	17.5	4.0
Training	6.0	—

Figure 5

GROWTH FORECAST FOR SMALL AND MEDIUM HELICOPTERS
For U.S. and Canada.

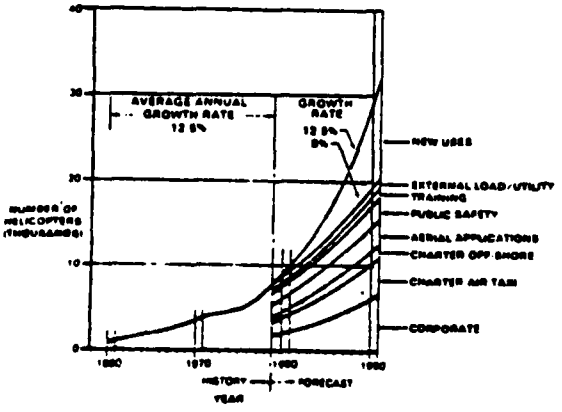


Figure 6

Helicopter growth forecasts in the U. S. and Canada during the 80's by type of application are impressive. "New uses" would include city-center to city-center scheduled helicopter service as well as scheduled intraurban helicopter service.

With its inherent maneuverability and capability to use small takeoff and landing areas under virtually all weather conditions, IFR helicopters, along with other vertical takeoff and landing (VTOL) vehicles under development, have the potential for greatly expanding the total national air transportation system. To achieve such expanded air transportation, the navigation and ATC systems must be integrated and so configured as to take maximum advantage of the unique performance capabilities of the helicopter. These include the ability to slow down and accelerate rapidly, to hold and maneuver in a limited airspace, to execute multisegment approaches and steep ascent gradients (thus facilitating noise reduction and obstruction clearances), and to operate to and from an almost limitless number of small takeoff and landing areas.

An ultimate goal for helicopter operations is to have a high accuracy navigation system capable of providing area navigation (RNAV) without the need for point reference ground navigation aids. Signal coverage should be down to the surface without the constraints of line-of-sight (LOS) limitations so as to permit low altitude operations.

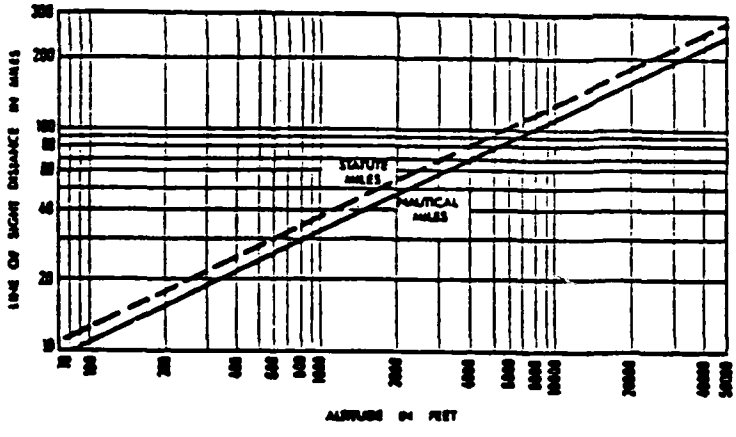


Figure 7

Figure 7 illustrates the basic LOS relationship between aircraft altitude and distance from a typical VHF/UHF ground navigation station, e.g., a VORTAC. For example, in using a VOR/DME RNAV airborne system for an instrument approach, if the MAP (missed approach point) waypoint were 25 nm from a VORTAC, the MDA (minimum descent altitude) would be no less than 500 ft. in order to maintain signal input. In specific cases, this situation could be worse (e.g., due to mountains) or somewhat better (e.g., over water.)

The navigation system should be capable of providing narrow, discrete helicopter routings to facilitate segretation of helicopters and conventional takeoff and landing (CTOL) aircraft and to conserve airspace. Similarly needed are discrete instrument approach and missed approach procedures offshore and onshore to heliports, helipads at CTOL airports and points-in-space, as well as in remote areas.

Thus, it should be possible to operate helicopters without interference to or from airlines and other conventional aircraft, in many cases sharing the same landing areas, but not the same runway. The potential of helicopters cannot be achieved if they are to be handled in the Air Traffic Control (ATC) system as fixed-wing, conventional aircraft, particularly in high density areas. Separation of helicopters from the fixed-wing aircraft will not only benefit the helicopter, but will also benefit the fixed-wing traffic and the ATC system.

THE NORTHEAST CORRIDOR

The "Northeast Corridor" (NEC) as used in this report is the area in the northeastern part of the United States bounded on the north by Boston and on the south by Washington. It also includes the area bounded on the west by Albany and Allentown, and on the east by the Atlantic Ocean.

An NEC VOR/DME area navigation (RNAV) discrete helicopter route structure was established progressively by the Federal Aviation Administration (FAA) in cooperation with the Helicopter Association of America (HAA) during the period 1975-1978. The first segment was established in 1975 between Allentown and the New York area in response to a helicopter operator's specific needs for a discrete IFR RNAV route. By the end of 1978, the NEC basic route structure was completed connecting Boston and Washington (via New York) with two parallel one way routes, and including single spurs to Allentown and Albany (Appendix A). In addition, thirteen "point-in-space" (PIS) helicopter descrete RNAV instrument approach procedures (IAP's) were established (see Appendix B for examples).

Charts of the route structure and the IAP's were developed by Jeppeson & Company and were printed at the expense of interested helicopter operators by March 1979. FAA R&D purchased a sufficient number of copies of the charts to provide to the ATC facilities along the corridor and other FAA offices interested in the NEC evaluation.

In April 1979 the HAA entered into a fourteen month contract with the FAA to conduct a "Helicopter Northeast Corridor Operational Test" project.

OBJECTIVES OF NEC OPERATIONAL TEST

The objectives of the test project basically responded to the unique helicopter operational concepts outlined in the Introduction to this report. The objectives also reflected an understanding of the growing importance of helicopters as indicated in that section.

More specifically, as called for under the FAA contract, "the contractor (HAA) shall provide all necessary qualified personnel, facilities, material, equipment and services for the acquisition, processing and analysis of data resulting from the Helicopter Northeast Corridor Operational Test. This effort shall include, but not be necessarily limited to, the following tasks:

A. The contractor shall:

1. Develop and coordinate methods and materials to encourage extended use of the "Northeast Corridor" (NEC) by the helicopter operators during the entire extended test period under both visual (VFR) and instrument (IFR) flight conditions. This shall include operators performing on their appropriate spurs and use of the appropriate instrument approaches for heliports and airports.
2. Develop and coordinate materials for collecting and analyzing data from the helicopter operators to be used in making appropriate recommendations to the Federal Aviation Administration (FAA) regarding the NEC tests. Appropriate recommendations shall include, but are not limited to:
   - Interface with fixed wing routes;
   - Coverage along routes and approaches for navigation,

radar and communication;

- Performance at low-operational altitudes;
- Video map accuracy;
- Adequacy of holding pattern airspace areas;
- Route widths; and
- Impact on air traffic control (ATC) using present helicopter Terminal Instrument Procedures (TERPS) criteria for approach, missed approaches, departure procedures and operational and approach minima.

3. Develop recommendations from the extended NEC test period to be used by the FAA when considering the development of inter-city routes and associated instrument approaches in other parts of the country.

4. Develop operational requirements for helicopters to be used in developing ATC systems and services for immediate and future needs of helicopters in support of the FAA's Helicopter Operations Development Plan.

B. Deliverable Items

Item 1a. Experience Summary - The contractor shall deliver a summary containing experiences of helicopter operators during the test period of Northeast Corridor operations to date. This summary shall consist of pro and con comments regarding the "facets" of the corridor referred to in part A. 2 of Article I above, as well as recommended changes for improvement.

Item 1b. Experience Summary Updates - The contractor shall update the above stated summary.

Item 2. Final Report - The contractor shall deliver a final report which fully describes the experience gained by helicopter operators during the extended test period of the Northeast Corridor. In addition, the final report shall contain operational requirements and recommendations for system

development appropriate to satisfying the helicopter operators needs."

NEC EVALUATION TEST PLAN

The NEC evaluation test plan was designed to provide a data base which would be effective in responding to the objectives of the NEC operational test as set forth in the FAA/HAA contract referred to above. Both objectively and subjectively derived data were contemplated.

Considerable objectively derived data were based on the use of In-Flight/Post Flight Data Logs and related radar tracking records. The log form is shown in Appendix C along with instructions to pilots for filling them out. From the period July 15, 1979, start of the evaluation test plan, to its termination on April 15, 1980, 220 logs were received by the HAA. These in turn were reviewed by the HAA Project Manager, particularly for pilot and/or ATC problems, and then sent to the NEC radar tracking coordinator at the FAA Technical Center for radar tracking data reduction. Subjectively derived data were obtained from the pilots' remarks on the data logs and also as a result of numerous meetings and contacts with helicopter pilots, operators and manufacturers, as well as with FAA Washington and field personnel (refer to "Acknowledgements").

After some three months of preparation by the HAA and the FAA, the NEC evaluation test plan was inaugurated on July 15, 1979. Appendix D is a memorandum dated July 10, 1979, from the HAA Project Manager to "All Participants and Interested Parties in the HAA/FAA NEC Evaluation Project" announcing inauguration of the evaluation test plan. The master roster of the "participants and interested parties" is set forth in Appendix E. NEC coordination contacts are listed in Appendix F.

Subsequent to the memorandum in Appendix D, a number of updated guidance/information memos and instructions were issued by the HAA Project Manager, together with some issued by or in conjunction with the FAA Technical Center's NEC coordinator. The final communication advising of

the conclusion of the NEC evaluation project was issued by the HAA Project Manager on March 20, 1980. This communication advised that the radar tracking effort by FAA facilities concerned with the NEC project would be terminated officially as of April 15.

In this same communication the Project Manager said that after April 15, "I urge that In-flight/Post flight-cards be submitted (on a completely voluntary basis) to report either good or bad ATC handling. In problem cases, I will bring these to the attention of the FAA to supplement any contacts which may be initiated locally by the helicopter pilot/operator concerned."

Note: Copies of all NEC instructions and information documents are contained in HAA Progress Reports Numbers 1, 2 and 3, dated July 16, 1979, October 19, 1979 and January 19, 1980, respectively, which are on file with the FAA's Systems Research and Development Service.

AC 73 - 2

In anticipation of the inauguration of the Helicopter Northeast Corridor Operational Test Project, the FAA, in coordination with the HAA, issued Advisory Circular 73-2 dated June 11, 1979, subject "IFR Helicopter Operations in the Northeast Corridor". This Circular is reproduced as Appendix G, and provides guidelines for use of the discrete helicopter RNAV NEC structure. In accordance with this AC, FAA approval is required to operate IFR on the structure and procedures for obtaining such approval are stipulated. The NEC structure was not authorized for public use, and as a result, public use enroute and approach charts have not been issued. The corridor routes have a minimum altitude as low as 1700 feet AGL, with a maximum authorized altitude of 5000 feet MSL. Route width is 4 nm (2 nm each side of centerline).

SFAR 29-2

The FAA on January 3, 1979, issued Special Federal Aviation Regulation (SFAR) No. 29-2 (see Appendix H). This SFAR provided for somewhat

simplified regulations governing IFR certification of helicopters. The HAA played an important role with the FAA in the development of this SFAR and subsequent implementating procedures in the interest of facilitating helicopter IFR operations.

On July 12, 1979, the FAA issued Notice 8710-2 "Approval Procedures for Operations under Special Federal Aviation Regulation (SFAR), No. 29-2". This Notice was distributed to FAA Flight Standards, in Washington headquarters, the regions, and the Aeronautical Center to the branch level; and to all Flight Standards and International Aviation field offices.

The Notice provided detailed instructions to Flight Standards field personnel, including GADO's, on how to extend approval for operation under SFAR 29-2. Included in this Notice is provision for IFR approval of single pilot operations, as follows:

"Single pilot operations may be approved for those aircraft type certificated for a crew of one under VFR conditions if the installations include compensating features, such as a stability augmentation system (SAS) and/or autopilot. Such an approval will require only one set of flight controls. Single pilot operations shall not be authorized in terminal control areas."

On July 12, 1979, the HAA NEC Project Manager issued the following information to all NEC participants and interested parties:

"Operators in the NEC wishing to take advantage of SFAR 29-2 (either for dual or singel pilot operation), should contact the GADO/FSDO having jurisdiction over the area in which the applicant's principal business office is located. Present operators who have been approved need not reapply. Letters of approval will be issued to operators authorized to fly under this Notice.

" Any operator qualifying under SFAR 29-2 is eligible to <u>apply</u> for FAA approval to fly IFR on the Northeast Corridor. However, it should be kept in mind that specific authorization to <u>operate</u> IFR on the NEC is still required in accordance with Advisory Circular 73-2 "IFR Helicopter Operations in the Northeast Corridor".

"With regard to flying VFR on the NEC, a pilot having a helicopter equipped with an RNAV meeting AC 90-45A Criteria may file a flight plan using the standard IFR flight plan (NAS) format, but in the altitude box state "VFR" instead of a specific altitude. In the remarks column state "VFR test". Such flight plans should be filed with the appropriate FSS facility before takeoff, not enroute. It will, of course, be the pilot's responsibility to stay VFR at all times. All pilots filing a VFR test flight plan are asked to fill out and send in a copy of the Flight Data Log form whenever possible.

"As for flights on the NEC by operators IFR qualified per AC 73-2, pilots are encouraged to file an IFR flight plan to the maximum extent possible per "Alerting-Flight Procedures" in my memo of July 10, regardless of weather. It is realized that this may cause some inconvenience in certain instances. However, to maintain pilot proficiency and enhance controller training, this procedure will be well worthwhile in the long run in terms of facilitating operation and ATC handling when actual IFR and/or IMC conditions are encountered.

"With regard to charts for use of the NEC per AC 73-2, please refer to Paragraph 3. b of this Circular. The parenthetical note at the end of this paragraph states:

> "Several operators have joined forces to print charts. For further information on availability of these charts, contact the Helicopter Association of America."

"This is to advise that the North East Helicopter Operators' Council (NEHOC) (subsequently changed to Eastern Region Helicopter Council) has undertaken to arrange the interim publication of the NEC charts until such time as the NEC routes and approach procedures may be designated for public use per paragraph 3. b of AC 73-2. At that time, it is expected that appropriate charts will be published by the government.

"In the meantime, the enroute RNAV charts (Washington - Boston) and charts for the 13 approved RNAV instrument approach procedures may be obtained from:

Mr. Craig Wheel
(Custodian for NEHOC Charts)
c/o Atlantic Aviation/DuPont
P.O. Box 15000
Wilmington, DE 19850

Tel: 302 322-7000."

Subsequently, the HAA issued two information bulletins dated July 16, 1979, and September 25, 1979 (attached as Appendices I and J) which were worked out with the FAA to further simplify helicopter IFR certification procedures

NEC IFR HELICOPTER OPERATORS

As of May 15, 1980, the following is a list of the 11 helicopter operators who have been fully qualified to fly IFR on the NEC per AC 73-2, plus one in the final stages of approval:

Boardwalk Regency
Phoenix Aviation
View Top Corporation
Atlantic Aviation
RCA Corporation
Mack Trucks
* Tyco Labs, Incorporated
United Technology
Wheelabrator-Frye, Incorporated
The New York Department of Environmental Conservation
Savin Business Machines Corporation
** Johnson & Johnson

*(Planning use of Loran C RNAV as well as VOR/DME RNAV)

**(In process using VOR/DME RNAV and Loran C RNAV)

These operators are flying at least one IFR helicopter and about five have additional helicopters either now flying or on early delivery order.

A number of the helicopters involved were IFR certificated under SFAR 29-2.

In addition, two manufacturers advised that they expect to have at least six each of their latest models in the hands of customers who will use the NEC by the end of 1980. Probably 10-15 other model IFR helicopters also will be added to the NEC by the end of 1980. In a rough survey made by the HAA Project Manager in May 1980 at meetings with the NEHOA and ERHC, it was estimated that at least 30 more IFR helicopters will become operational on the NEC during 1981. Also, there are a number of companies (e.g., Digital Equipment Corporation) that plan to operate IFR on new RNAV routes which will expand the current NEC coverage during the next year or so.

In the light of the foregoing, the following is a conservative estimate of what may be expected in terms of IFR helicopters operating in the NEC environment within the next two years:

Currently IFR operational	15
By end of 1980 (additional)	25
By end of 1981 (additional)	30
Miscellaneous additions due to adding new RNAV routes and IAP's.	20
TOTAL	90

CHARTS

As pointed out previously, since the NEC routes are not approved for public use, it has been necessary for the operators to work out the publication and distribution of the required charts at their own expense. One company (noted previously) volunteered to act as the custodian of charts for all users, and charges a nominal fee for chart sets.

At present, the chart custodian sends out notices to all registered NEC chart holders advising of changes, which the holder is then expected to make with pen and ink on his charts. Appendix K provides examples of this procedure.

NEC ROUTE WIDTH CONSIDERATIONS

The basic enroute RNAV route width is 8 nm (4 nm each side of the route centerline), and the basic terminal area RNAV route width is 4 nm (2 nm each side of the route centerline). The narrower terminal area route width, however, requires that waypoints be no more than 25 nm from a VORTAC facility (ref. AC 90-45A), and that pilots fly in the RNAV terminal area/approach mode on their instrumentation.

In planning the NEC structure, a fundamental objective was to develop discrete helicopter RNAV routes which would permit IFR operations without interference to or from fixed-wing traffic. Obviously, the basic 8 nm enroute RNAV route width would not permit achieving this objective in the high density NEC environment. Consequently, it was apparent that the 4 nm terminal area route width would need to be applied if the foregoing objective were to be at all possible.

However, in order to meet the criteria for the $\pm$ 2 nm route width (terminal area), a large number of waypoints were required to define the RNAV routes. An examination of Appendix A indicates that the mean NEC waypoint spacing is about 15 miles. Waypoint-VORTAC distances run 0-26 nm.

Appendix L shows a collection of typical radar tracings of NEC VOR/DME RNAV IFR flights. A few tracing samples of Loran C RNAV flights conducted by the FAA Technical Center in their CH-53 are shown in Appendix M. The route widths shown are to scale (2 nm each side of centerline). Segments may be identified by reference to Appendix A (compare waypoint numbers and names). Some NEC route segment utilization samples are shown in Appendix N.

HAA/FAA HELICOPTER WORKSHOP

Paragraph A. 4 of the Statement of Work in the FAA/HAA NEC contract calls for the development of operational requirements in ATC systems for

helicopters in support of the FAA's Helicopter Operations Development Plan. This task was expanded by the HAA in cooperation with the FAA, into a joint HAA/FAA Helicopter Workshop held October 23 - 25, 1979. The Final Report of this Workshop was delivered to the FAA in December 1979 .

ANALYSIS OF NEC FLIGHT DATA LOGS

Of the total number of In-Flight/Post-Flight Data Logs filed (220) during the nine months NEC test and evaluation period (July 15, 1979 - April 15, 1980), an analysis shows the following breakdown:

1. Rated by the pilot as having received good or excellent ATC handling 159

These ratings meant that ATC accomodated the flight per NEC flight plan as filed and that there were no significant delays on takeoff, enroute or approach and landing.

2. Rated by the pilot as having encountered ATC related problems: 47

These ratings were broken down as follows:

Delays of 10-45 minutes in obtaining departure clearance 25

Excessive departure delays causing pilot to cancel flight 4

Flight on NEC or NEC routing as proposed by pilot not accepted by ATC 15

Controller unaware of NEC structure 3

3. Holding encountered enroute. 7

Holding delays varied from a minimum of 4 minutes to a maximum of 10. Holding patterns were all 360° turns right or left.

4. Missed RNAV PIS approaches 2

No holding procedure was needed in either missed approach. Flights proceeded without incident to alternates.

5. RNAV equipment related problems..... 5

Wrong VORTAC frequency selected by pilot.....1

Lost DME on approach.....2

Enroute charts not corrected for waypoint change.. 2

FAA NORTHEAST AREA PROCEDURAL STUDY

The Eastern and New England Regions prepared a plan, released February 12, 1980, calling for an IFR "Northeast Area Procedural Study". The first briefing on this study was held on May 9, 1980.

With respect to helicopter operations, the study identified the following task:

PROBLEM	Systems capacity to handle present and anticipated IFR helicopter operations in and around major hub areas.
SOURCE	New York Common IFR Room, New England and Eastern Regions.
BACKGROUND	Terminal complexities, geographical constraints and increased traffic demands within metropolitan areas diminishes the capabity of the terminal air traffic systems to handle IFR helicopter operations without creating delays to fixed wing aircraft arriving and departing. Helicopters have unique capabilities and yet are treated as a fixed wing in an IFR environment.
VALIDATION	Geographical locations of airports/helipads, environmental constraints, existing criteria.
FACILITIES INVOLVED	Major Hub Approach Facilities.

The experience gained during the NEC evaluation as described in this

report should provide a basis for helping to resolve this problem.

NEC VFR/HSVFR CONSIDERATIONS

When the NEC concept was developed it was concluded that to avoid potential IFR helicopter/fixed wing conflicts, it would not be possible to provide for instrument approaches directly at a helicopter landing area, either on a conventional airport or on a heliport. This was basically because of (a) the lack of electronic instrument landing aids to serve such discrete approaches, and (b) the lack of sufficient accuracy and coverage in the VOR/DME RNAV system to permit such approaches. ATC radar separation criteria were another factor that had to be taken into consideration.

Consequently, a plan to use "Point-in-Space" (PIS) approaches was adopted. The PIS approach points are at the MAP of each COPTER RNAV approach procedure. When reaching the PIS MAP, the pilot establishes visual contact with the surface at MDA, or executes a missed approach (trying again or going to alternate). If visual contact with the surface is established at MDA, the pilot then proceeds VFR or Helicopter Special VFR (HSVFR) to the desired landing area. On an IFR departure, VFR or HSVFR generally is followed to rejoin the NEC, or radar vectoring may be employed if agreeable to ATC.

Note: HSVFR is considered to mean that the pilot has sufficient vertical or slant range visibility to identify check or holding points and follow a desired flight path by visual reference to the surface.

Several metropolitan areas in the NEC have some sort of organized helicopter VFR routes. In the case of the Washington area, these have been charted by the Department of Defense, but are made available by the DOD for civil use. Routes are identified by number. The NEC structure ties into this system through a PIS instrument approach procedure. Boston on the other hand, merely has a descriptive VFR helicopter route system which may be obtained from the BOS tower.

In the New York metropolitan area (in 1979 VFR helicopter operations totalled over 100,000), the Eastern Region Helicopter Council has presented a VFR/HSVFR route/chart plan to the FAA based on the following principles:

Develop a VFR TCA route chart for helicopter/seaplane use. Recommend a chart encompassing a 25 nm radius from the 59th Street bridge.

Recommended format

- Simplified road map (delete small streets).
- Include navigation and aeronautical information.

Route and checkpoint criteria

- Display a minimum number of transit routes for LGA, JFK and EWR, which
  - (a) have the least impact on or from fixed wing traffic flow for most runway configurations.
  - (b) are representative of presently-used routes.
  - (c) should remain usable in helicopter special VFR conditions (HSVFR).
- Display an adequate number of checkpoints not associated with the routes. These should be:
  - (a) easily recognizable geographic or man-made fixes.
  - (b) points that are well known and presently in use.
  - (c) depicted by photograph or recognizable graphic illustration.
- Recommend encouraging operators to use the routes to reduce communication congestion and expedite traffic flow. However, routes should not be mandatory. Operators must have the option of point-to-point routing when advantageous to their flight. A notice to this effect should be printed on the chart.

Helicopter Arrival/Departure Routes at TEB, MMU and FRG

- These routes are for arriving and departing helicopters in

VFR/HSVFR conditions as opposed to transit routes previously described.

- Should be depicted with individual tower concurrence.

Chart use

- Should be published as the Helicopter/Float plane VFR/HSVFR route structure to exclude mass use by fixed wing general aviation aircraft. Suggest including a notice on the chart to subtly discourage its use to this effect:

"This chart is intended for Helicopter and Float plane operators within the TCA. Avoid unnecessary use."

Other recommendations have been made by the ERHC to the FAA Eastern Region such as calling for improved communications facilities for VFR operations with the LGA tower and reduced separation criteria in the TCA between helicopters and fixed wing traffic. These recommendations are under continuing review by the FAA.

CONCLUSIONS

• Interface with fixed wing routes.

The analysis of the in-Flight/Post-Flight Data Logs indicates that about 70% of the flights were without incident, and therefore may be considered to have been conducted without conflict to or from fixed wing traffic. Thus, it is concluded that the concept of non-conflicting discrete helicopter route interface with fixed wing routes is feasible.

However, about 20% of the recorded flights encountered some problem which may be attributable to potential conflict with or from fixed wing aircraft. The preponderence of these involved delays in helicopter departures, followed by refusal by ATC to permit the pilot to use the NEC as planned for optimum flight. Such problems need and can have reasonable solutions. Arrivals, on the other hand were virtually free of adverse interface with fixed wing traffic as evidenced by the fact that only about 3% of the flights were assigned holding patterns enroute, and these for very nominal amounts of time.

It was noted from examination of the flight logs that the incidence of problems encountered was directly related to the frequency of use of particular NEC segments by individual pilots. In other words, as exposure to operation on the NEC was increased by both pilots and controllers, more and more flights were carried out with "good handling" reports by the pilots.

The foregoing conclusion points to the usefulness of performing all flights in accordance with IFR, even though VFR weather conditions exist. Although provision was made in the NEC evaluation procedures for the filing of "VFR test" flight plans, very few were submitted. This was because the existing NEC IFR route structure generally required more flight time than was needed for direct helicopter VFR operations.

The great majority of flights were performed below most fixed wing traffic at 2000' or 3000' MSL. This fact, plus the discrete helicopter IFR RNAV routes and IAP's, greatly facilitated non-interfering helicopter/fixed wing interface. A few pilots favored even lower MEA's, i.e., 500' AGL in some segments of the NEC structure to further facilitate non-interference.

There was a tendency, however, by many controllers to want to treat helicopters like fixed wing aircraft. This was especially true when pilots operated to/from conventional fixed wing airports, even though those airports had segregated helipads.

Experience indicated the need to have more flexibility in designing and obtaining helicopter RNAV discrete routes and IAP's. Currently, a number of NEC extensions are desired or are being considered. With increasing helicopter IFR traffic, a low level network of narrow, helicopter discrete RNAV routes can be visualized as being needed for the NEC environment within the next few years. This would no doubt be developed on an evolutionary, progressive basis.

Experience also pointed to the need for more flexibility in being able to join the NEC under IFR condition at pilot selected points. Leaving the NEC did not present a significant problem when the pilot could cancel IFR and proceed VFR/HSVFR.

A growing need for organized VFR/HSVFR helicopter routes in metropolitan areas to facilitate fixed-wing interface is becoming apparent. Yet the use of these organized VFR/HSVFR routes needs to have sufficient flexibility so as to meet variable helicopter operational requirements.

• Coverage along routes and approaches for navigation, radar & communication.

No significant gaps in navigation and communication coverage throughout the NEC evaluation period were reported by pilots. Lack of any significant radar coverage was not evident from pilot flight logs, and radar tracking data appeared to be generally adequate (see Appendices L and M). However, it was understood at the initiation of the NEC project that continuous radar surveillance was not required, as procedural separation would be applied by ATC if required.

• Performance at low-operational altitudes.

At the MEA's established, no performance problems were encountered at low-operational altitudes. In some instances ATC called for higher altitudes (up to 5000') which in a few cases resulted in placing the helicopter in icing or an adverse wind situation. In the case of PIS instrument approaches, only two instances of losing DME inputs were encountered, as noted previously. However, it should be recognized that when NEC routes and IAP's were flight checked by the FAA, low operational altitudes were confirmed as published.

• Video map accuracy.

During the early period of NEC operation, all helicopter RNAV routes were not accurately shown on the radar video maps. However, during the test period covered by this report, no video map inaccuracies were reported by pilots.

• Adequacy of holding pattern airspace areas.

On the basis of the seven holding incidents reported during this evaluation period, it was noted that holding patterns consisted of 360° turns, right or left, as was better from a traffic (or obstruction) standpoint. With a holding speed of 90 knots and a standard turning rate of 3° per second,

the turning radius would be about 3000 feet (one nm diameter). Obviously this holding pattern used a fraction of the airspace involved with the standard Holding Pattern No. 1 as called for in the TERPS Manual. In actual real world IFR helicopter operations, as per this project, holding was applied by ATC as needed, and not at some predetermined point shown on a chart. Further, with RNAV, the pilot was able to maintain a reasonably accurate holding flight path without adverse effects from cross winds. Also, with the ability of helicopters to slow down rapidly, speed control by ATC and pilot materially reduced the need for holding.

• Route Widths.

The radar track tracings reproduced in Appendix L show a high degree of conformity by pilots to the 4 nm wide NEC routes (2 nm on each side of centerline). All of the flights tracked as shown in Appendix L used VOR/DME RNAV. Deviations from centerlines are considered generally to be the result of anamolies in the VOR/DME signal inputs rather than FTE (Flight Technical Error). As pointed out previously, these narrower route widths and in turn the minimal FTE factor were possible due to the relative closeness of the NEC waypoints to VORTAC's, resulting in a relatively high degree of along-track and cross-track positioning accuracy. In addition, pilots flew with their RNAV equipment in the terminal area or approach mode, giving a more sensitive readout of cross-track deviation. On the other hand, the close spacing of waypoints obviously had an adverse effect on pilot workload. Some limited evaluation flights using Loran C are shown in Appendix M.

The results of this evaluation project show conclusively that the 4 nm wide VOR/DME RNAV route widths are feasible in the NEC. It is very likely that even narrower route widths would be possible with an improved accuracy RNAV system such as NAVSTAR GPS or perhaps Loran C.

• TERPS Impact on ATC

Helicopter terminal instrument procedures (TERPS) criteria are in need of a thorough updating to reflect other systems of navigation than those now covered. RNAV (of all categories) is a case in point as one of the many update areas required.

With respect to the specific experience gained in the NEC evaluation project, significant aspects of current TERPS impact on ATC may be summarized as follows:

- Airspace required by helicopters for holding can be significantly reduced.

- Predetermined holding patterns do not need to be shown on helicopter RNAV discrete charts, as ATC can set these up as particular circumstances may warrant.

- Holding patterns for helicopter missed approaches are not needed as an integral part of the missed approach procedure.

- Helicopter missed approach procedure airspace can be reduced, particularly when using RNAV.

- Helicopter RNAV approach minimums may be lowered in some instances if reduced missed approach airspace requirements are applied.

- Helicopter departure criteria do not exist in TERPS.

• Advisory Circular 73-2

AC 73-2 was designed for the specific purpose of specially qualifying operators and helicopters on the NEC for the test and evaluation period. By virtue of establishing the NEC as a non-public use route structure, charting problems were encountered as previously outlined in this report. The AC also had some restrictive effect on NEC utilization as a result of the rather cumbersome procedures required to achieve NEC IFR operational approval through FAA GADO's.

• Special Federal Aviation Regulation 29-2.

The SFAR served a useful purpose in stimulating interest in obtaining IFR approval for VFR certificated helicopters. However, because of its limited period of validity (expires December 31, 1980), many operators opted not to take advantage of its provisions, on the basis that their IFR certification might not be valid at a later date. Also, it was found by a number of operators that it was very difficult and time consuming to process SFAR 29-2 IFR approval through their local GADO's.

• NEC IFR Helicopter Operators.

The number of IFR helicopters flying on the NEC during the test and evaluation period was not as high as originally anticipated. This was largely due to delay by manufacturers in delivering IFR certificated helicopters from factories, relatively low use of SFAR 29-2, and some inhibiting aspects of AC 73-2. Nonetheless, a sufficient number of operators participated to provide an adequate data base for the purposes of the project.

• Development of inter-city routes and IAP's elsewhere.

Lack of city center heliports is a major obstacle in the development of inter-city (and intraurban) short haul helicopter service. The HAA has a national heliport development advocacy program underway. In the NEC, the ERHC and NEHOA are promoting heliport development at the local level. In some cases, heliports can be on the surface; in others, they will need to be elevated.

However, lacking a heliport for inter-city helicopter service, helipads can be located on conventional fixed wing airports (e.g. BOS, LGA, JFK, DCA). Helicopter discrete routes and IAP's will be needed to permit non conflicting interface with fixed wing traffic, as demonstrated in the NEC project.

Ideally, heliports/helipads should be served by dedicated instrument approach facilities (e.g. MLS), or by use of on-board precision type RNAV (e.g. NAVSTAR GPS). Airborne radar approaches (ARA) using ground transponder beacons also may be effective.

In developing inter-city routes and IAP's in other parts of the country, the first step is to identify the helicopter landing area to be used (i.e., dedicated helipads on a conventional fixed wing airport and/or heliports). Once these landing areas are identified, instrument approach procedures should be established. Lacking dedicated precision approach capability, discrete helicopter RNAV PIS approach procedures will be needed as per the NEC concept. Finally, discrete (hopefully narrow width) helicopter routes will be needed to connect to the initial approach fix in each PIS procedure.

Maximum advantage should be taken of lowest possible MEA's.

As a general guideline, the foregoing steps should be taken on the basis of helicopter service and operational requirements. ATC and fixed-wing interface considerations should then be taken into account.

• Helicopter operational requirements for ATC systems and services.

A fundamental factor in developing helicopter operational requirements for ATC systems and services is that controllers be fully aware of the unique capabilities of helicopters and that the system be so designed as to be able to interface both helicopters and fixed-wing aircraft on a non-interfering basis. Principles involved in this concept have been discussed earlier in this report.

Based on the NEC experience, some unique helicopter operational ATC requirements identified were:

- Helicopter IFR flight profiles should closely approximate those possible under VFR/HSVFR.

- Transition from corridor IFR to VFR/HSVFR and vice versa should be smooth and require minimum pilot/controller communications.

- VFR/HSVFR route structures should tie in conveniently and effectively with corridor IFR structures.

- Provisions should be made to facilitate joining the corridor from conventional airways and vice versa; from off-corridor airports/heliports and from "pop-up" points.

- To facilitate the above, radar vectoring should be provided when radar surveillance is available, if requested by the pilot.

- Hand-off procedures for corridor operations need to be more responsive to helicopter operating capabilities (e.g., not requiring a climb to a higher undesirable altitude when entering the next sector).

- ATC radar helicopter/fixed-wing separation criteria should be reduced to facilitate helicopter discrete IFR takeoffs from conventional airports and heliports.

- The same reduced radar separation criteria should apply to arriving helicopter IFR traffic.

The procedures contained in ATC Manual 7110.65 are basically designed with fixed wing aircraft in mind. Many of these procedures, when applied to helicopters, may have a disadvantageous effect. Transition procedures from enroute IFR to a TCA, flight plan filing procedures and clearance delivery procedures are cases in point

RECOMMENDATIONS

The following recommendations, based on the NEC experience, are submitted to the FAA for consideration. The HAA is prepared to cooperate with the FAA as appropriate in carrying out these recommendations.

No. 1 A comprehensive program should be established to indoctrinate controllers in the operating characteristics and unique capabilities of helicopters. The current FAA project at the Houston Center should be reviewed in the light of the conclusions in this report, and the resultant finished product should be issued on a nationwide basis at the earliest possible date.

No. 2 Guidelines should be prepared for application of the helicopter/fixed wing non-conflicting interface concepts as developed in the NEC project. These should be issued to all ATC facilities and FAA Flight Operations personnel (including GADO's). Procedures for initiating requests for helicopter IFR discrete routes and IAP's should be streamlined and issued covering both ATC and Flight Operations aspects. Emphasis should be given to expediting the processing of such requests. An Advisory Circular reflecting the foregoing internal guidelines should be issued for the information of helicopter operators.

No. 3 Advisory Circular 73-2 should be cancelled and the NEC routes should be made public. Some special treatment should, however, be given to the need to conform to the narrow route widths. The NEC charts, including IAP's, should be published by the government per standard aeronautical charting procedures. An Advisory Circular setting forth guidelines for operation on the NEC as a public use system should

be issued

No. 4 The validity of Special Federal Aviation Regulation 29-2 should be extended indefinitely until such time as permanent FAR 27 and FAR 29 IFR helicopter certification regulations are issued. Procedures for processing SFAR 29-2 applications should be streamlined and applications handling by the FAA should be expedited.

No. 5 Planning should be expedited to provide improved RNAV systems accuracy and signal coverage down to the surface, and eliminate the relationship between accuracy and distance from signal point source facilities. On a near term basis, Loran C should be evaluated at the earliest possible date as a primary IFR RNAV system where signal coverage is available (e. g. the NEC). ARA with ground transponder beacons for instrument approaches should be evaluated. A NAVSTAR GPS civil RNAV concept validation program (as proposed by the HAA) should be given high priority.

No. 6 The current NEC route structure should be re-evaluated for the purpose of reducing waypoints to the fullest extent practicable. More direct routing possibilities also should be examined, with the objective of having them be as similar as possible to VFR route capability.

No. 7 Improved and expanded communication facilities should be provided, including RCAG's as necessary, to support more expeditious filing of flight plans and receipt of clearances, both for IFR flights and for VFR flights operating in a TCA. This program should meet both current helicopter operational needs in the NEC and longer range plans (see No. 8 below).

No. 8 A study should be initiated with the objective of developing a comprehensive low level network of discrete helicopter RNAV IFR routes and IAP's to meet both current and long range helicopter operational needs in the overall NEC area.

No. 9 A complete review and update of TERPS criteria for helicopters

(both for arriving and departing operations) should be undertaken and completed at the earliest possible date. The work already performed by/for the FAA provides a basis on which to start this effort. A major emphasis should be placed on establishing criteria for helicopter operations which will conserve airspace to the fullest extent feasible. All types of navigation aids should be covered as well as various types of RNAV. Industry inputs should be solicited. (The HAA has a TERPS Committee which can participate.)

No. 10 A test and evaluation project should be undertaken using an MLS in a real-world environment to serve a dedicated helipad on a conventional fixed wing airport (e.g. JFK). Key points in this effort would be to determine the feasibility of simultaneous instrument approaches by fixed-wing aircraft and helicopters; minimum separation between arriving/departing helicopters; simultaneous instrument departures by fixed-wing aircraft and helicopters; helicopter missed approach airspace requirements; limitations/adequacy of ATC radar separation criteria and radar target resolution. Also, multisegment approaches and coupled decelerating approaches to a hover should be included in this T & E effort. (Note: The currently planned FAA/NASA MLS helicopter simulation could be a useful prelude to this effort, but it is questionable if definitive results would be achieved only by the simulation.)

No. 11 NEC ATC/helicopter procedural problems or questions as encountered during this evaluation project, and as summarized in this report, should be looked into and corrective action should be taken as appropriate. In performing this task, the FAA should consult with the HAA, ERHC and NEHOA.

No. 12 A complete review of ATC Handbook 7110.65 and the Airmans Information Manual (AIM) should be conducted to examine all aspects affecting or relating to helicopter operations (IFR and VFR). Recommended changes should be incorporated by FAA directly or through Air Traffic Procedures Advisory Committee (ATPAC) at the earliest practicable date.

Industry inputs should be solicited. (The HAA has an ATC Committee which can participate.)

No. 13 A survey should be undertaken to evaluate the need for and application of the concepts developed by the NEC project for other parts of the country. This evaluation should cover not only current situations but also should be based on longer term expectations, considering the rather lengthy amount of time it takes (as evidenced by NEC experience) to develop a fully operational inter-city helicopter system. Indicated areas/regions should then be placed in an implementation mode, using the NEC concepts as a model. Figure 8 portrays a concept of the growing "Great Lakes Megalopolis" (lightly shaded areas). This megalopolis might very well be the next environment to use in applying the NEC model.

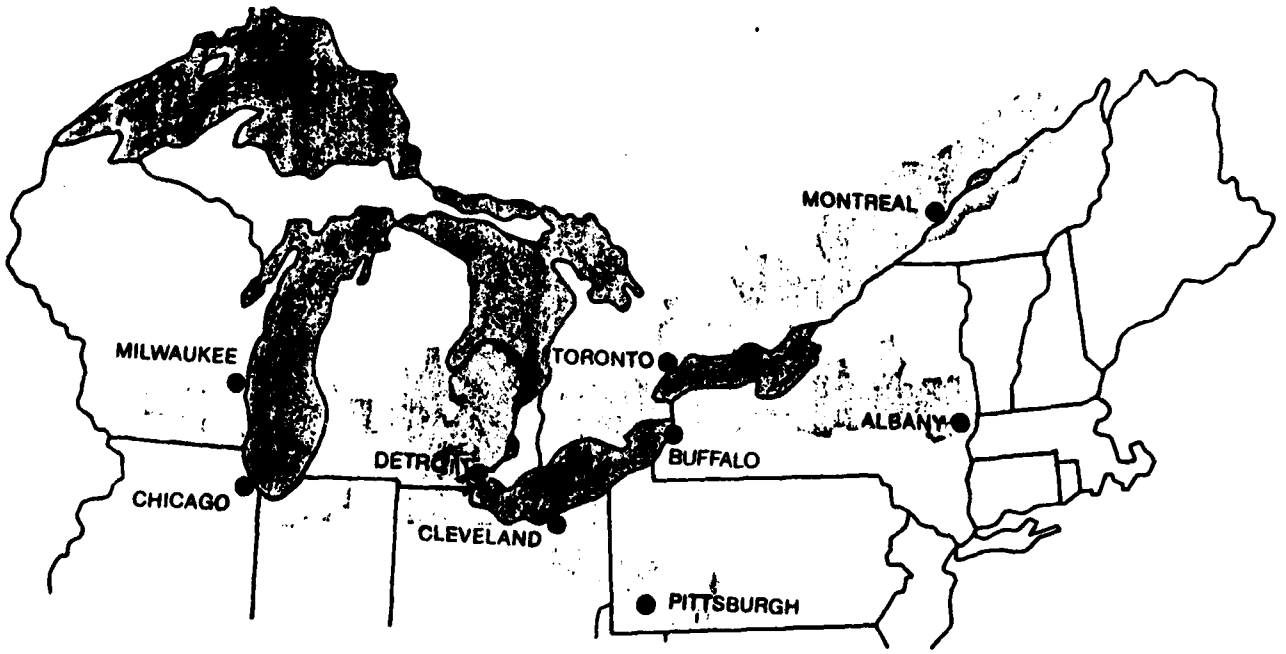


Figure 8

Victor airway 313R Washington, D C to Bridgeport
(This airway continued from Northeast Helicopter Corridor Routes (Washington, D C to New York) chart)

NO	NAME	IDENT	FREQ	ELEV	BEARING/DME DIST	VAR	LAT/LONG
32	ROLER	JFK	115 9	00	061 0°/20 0	11W	N405104 8/W732631 1
33	MAUDE	RVH	117 2	01	284 0°/19 8	13W	N405401 4/W732052 1
34	FLOPP	RVH	117 2	01	331 8°/13 0	13W	N410330 3/W730604 8
35	IGORR	RVH	117 2	01	359 8°/20 2	13W	N411324 1/W730052 5

Victor airway 315R, New York to Boston

NO	NAME	IDENT	FREQ	ELEV	BEARING DME DIST	VAR	LAT/LONG
51	AMUSE	DPK	111 2	01	315 0°/19 5	12W	N405805 7/W733980 1
52	HIPAN	DPK	111 2	01	335 0°/16 8	12W	N410054 9/W733136 2
53	ORALE	DPK	111 2	01	007 5°/18 3	12W	N410545 4/W732008 7
54	IGORR	RVH	117 2	01	359 8°/20 2	13W	N411324 1/W730052 5
55	DROUN	MAD	110 4	02	024 9°/2 9	13W	N412139 9/W724045 9
56	DANEY	PVD	115 6	01	297 0°/21 9	14W	N414819 5/W715420 4
57	MEEOW	BOS	112 7	00	245 4°/20 4	15W	N420825 3/W712045 9

Victor airway 316R, Boston to New York

NO	NAME	IDENT	FREQ	ELEV	BEARING/DME DIST	VAR	LAT/LONG
41	ROGEE	BOS	112 7	00	231 8°/21 1	15W	N420432 4/W711636 1
42	MOURO	PVD	115 6	01	296 9°/16 0	14W	N414659 8/W714639 3
43	CLINT	MAD	110 4	02	124 0°/4 2	13W	N411719 0/W723621 4
44	MUSIK	RVH	117 2	01	019 0°/14 5	13W	N410809 3/W725245 3
45	FLOPP	RVH	117 2	01	331 8°/13 0	13W	N410330 3/W730604 8
46	CLEMM	DPK	111 2	01	031 4°/14 9	12W	N410133 7/W731142 5

MAR 30-79 — Special Tailored

NORTHEAST HELICOPTER CORRIDOR ROUTES
(NEW YORK CITY TO BOSTON)

Victor Airway 309R, Allentown to New York

NO	NAME	IDENT	FREQ	ELEV	BEARING/DME DIST.	VAR	LAT/LONG
68	EAST TEXAS	ABE	117 5	07	240 2°/13 6	10W	N403451 2 W754103 6
67	AWARE	SBJ	112 9	02	265 0°/14 0	10W	N403119 6/W750215 6
66	SPURT	SBJ	112 9	02	238 0°/7 3	10W	N403005 0/W745038 4
65	TOLAN	SBJ	112 9	02	135 0°/18 0	10W	N402437 0/W742513 6
64	BANKA	COL	115 4	01	061 0°/6 5	11W	N402252 3/W740306 7

Victor Airway 313R, Washington, D C to Bridgeport

NO	NAME	IDENT	FREQ	ELEV	BEARING/DME DIST.	VAR	LAT/LONG
21	BERNY	BAL	115 1	01	151 5°/12 2	08W	N390026 0/W763023 0
22	MOISH	BAL	115 1	01	130 0°/17 7	08W	N390050 5/W762026 1
23	RUSEY	BAL	115 1	01	083 0°/22 8	08W	N391606 3/W761120 2
24	ABZUG	ENO	111 4	00	308 0°/24 6	09W	N392546 5/W755844 6
25	ZOIDS	EWT	114 0	01	283 0°/11 2	09W	N394107 6/W755147 5
26	HAMOR	EWT	114 0	01	333 0°/13 4	09W	N395120 3/W754718 0
27	PAOLI	EWT	114 0	01	021 5°/18 6	09W	N395831 9/W753205 0
28	ARCUM	ARD	108 2	03	246 0°/24 5	10W	N400126 0/W752055 0
29	TULLY	ARD	108 2	03	166 0°/5 0	10W	N401037 4/W745149 5
30	JONNS	RBV	113 8	03	317 0°/6 2	10W	N401552 1/W743611 6
31	BANKA	COL	115 4	01	061 0°/6 5	11W	N402252 3/W740306 7

(This airway continued on Northeast Helicopter Corridor Routes (New York to Boston) chart)

Victor Airway 314R New York to Washington, D C

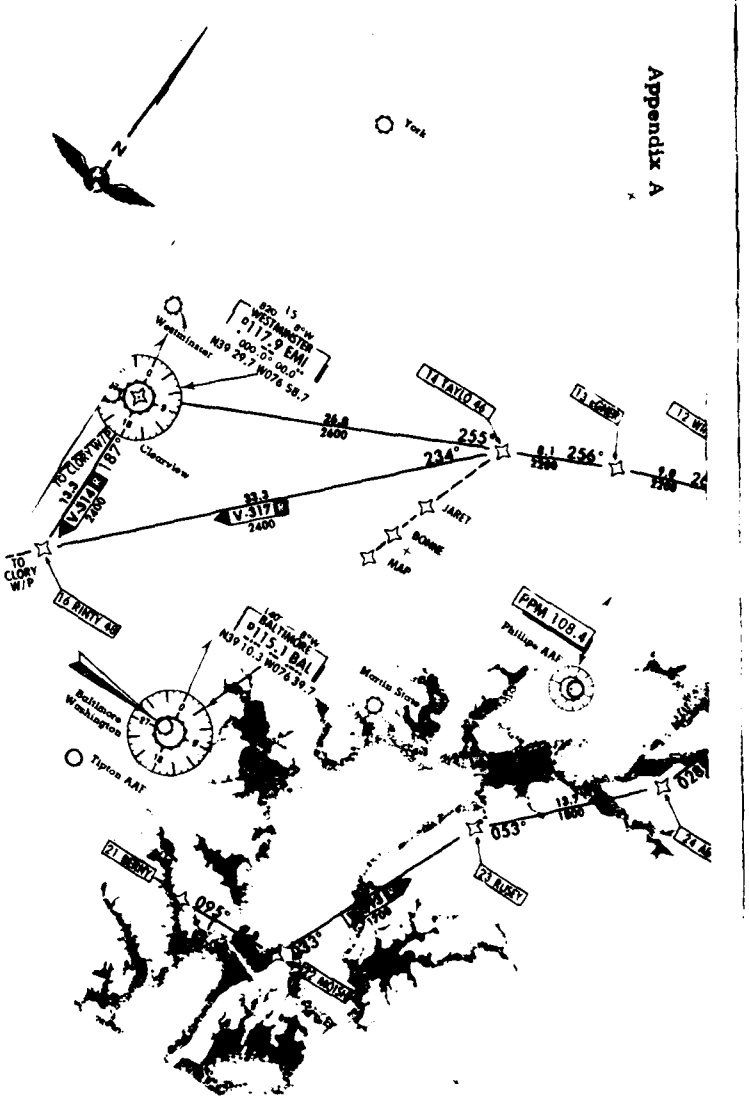
NO	NAME	IDENT	FREQ	ELEV	BEARING/DME DIST	VAR	LAT/LONG
1	DECKR	LGA	113 1	01	235 3°/11 2	12W	N403907 0/W740243 0
2	HYLAN	CRI	112 3	00	269 5°/9 2	11W	N403500 0/W740530 0
3	SPATE	CRI	112 3	00	252 7°/12 6	11W	N403045 4/W740813 6
4	BALDE	COL	115 4	01	002 5°/10 1	11W	N402841 4/W741134 0
5	TOLAN	SBJ	112 9	02	135 0°/18 0	10W	N402437 0/W742513 6
6	SLONE	SBJ	112 9	02	161 0°/16 4	10W	N402036 8 W743407 8
7	HAYER	ARD	108 2	03	083 0°/10 0	10W	N401806 6/W744158 8
8	GRIBL	ARD	108 2	03	144 0°/1 0	10W	N401430 0/W745332 3
9	BEKEL	ARD	108 2	03	255 5°/19 5	10W	N400703 8/W751736 5
10	SINON	MXE	113 2	05	039 5°/8 3	09W	N400213 4/W753447 2
11	WAGGS	MXE	113 2	05	259 0°/18 0	09W	N394852 3/W760213 3
12	WINGO	LRP	117 3	04	168 0°/22 7	09W	N394550 5/W760656 7
13	EGNER	LRP	117 3	04	190 0°/24 2	09W	N394258 6/W761802 5
14	TAYLO	EMI	117 9	08	075 0°/26 0	08W	N393947 6 W762744 3
15	WESTMINSTER	EMI	117 9	08	000 0°/00 0	08W	N392941 7/W765843 8
16	RINTY	EMI	117 9	08	187 0°/13 3	08W	N391623 1/W765825 9

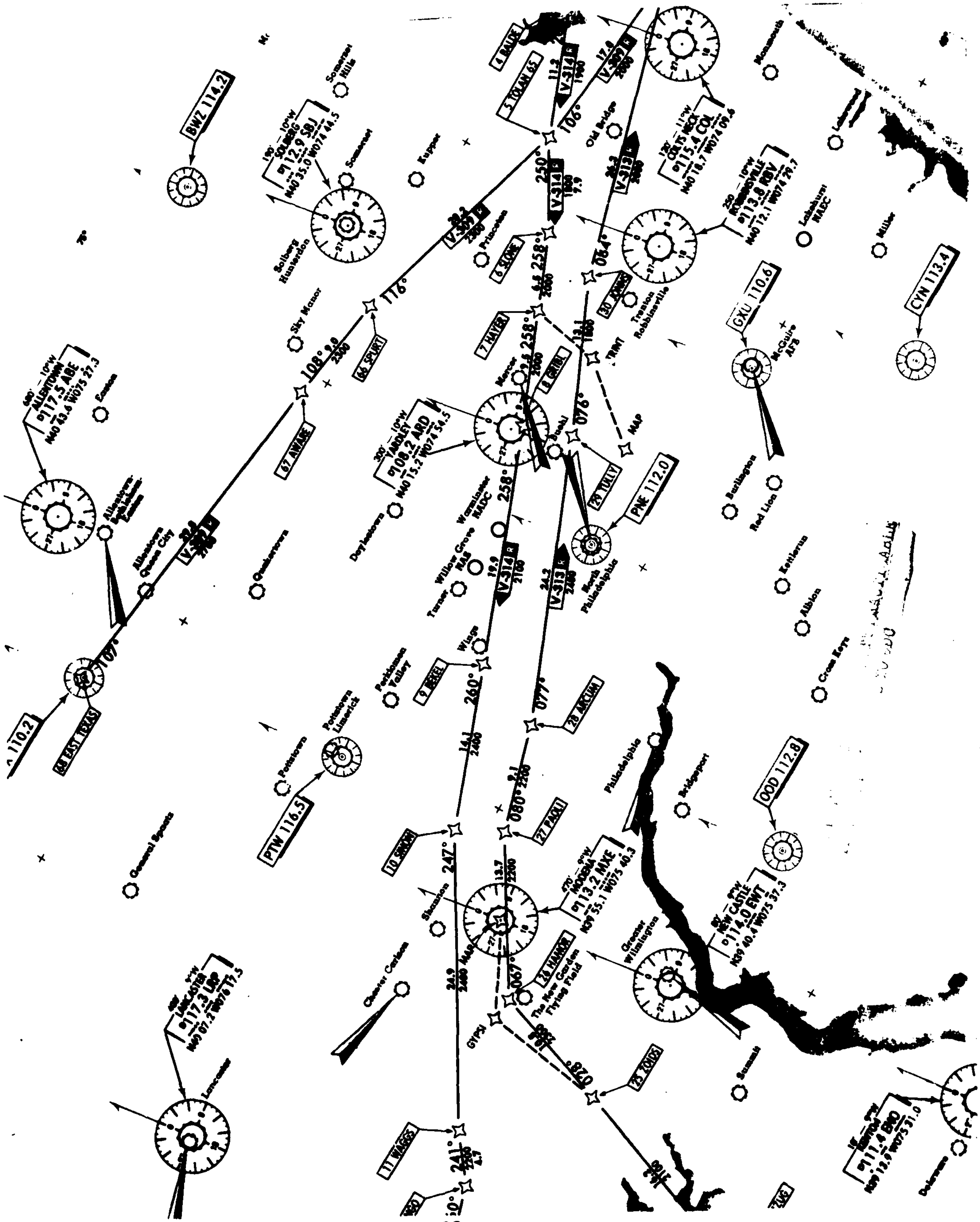
Victor Airway 317R, Alternate New York to DCA

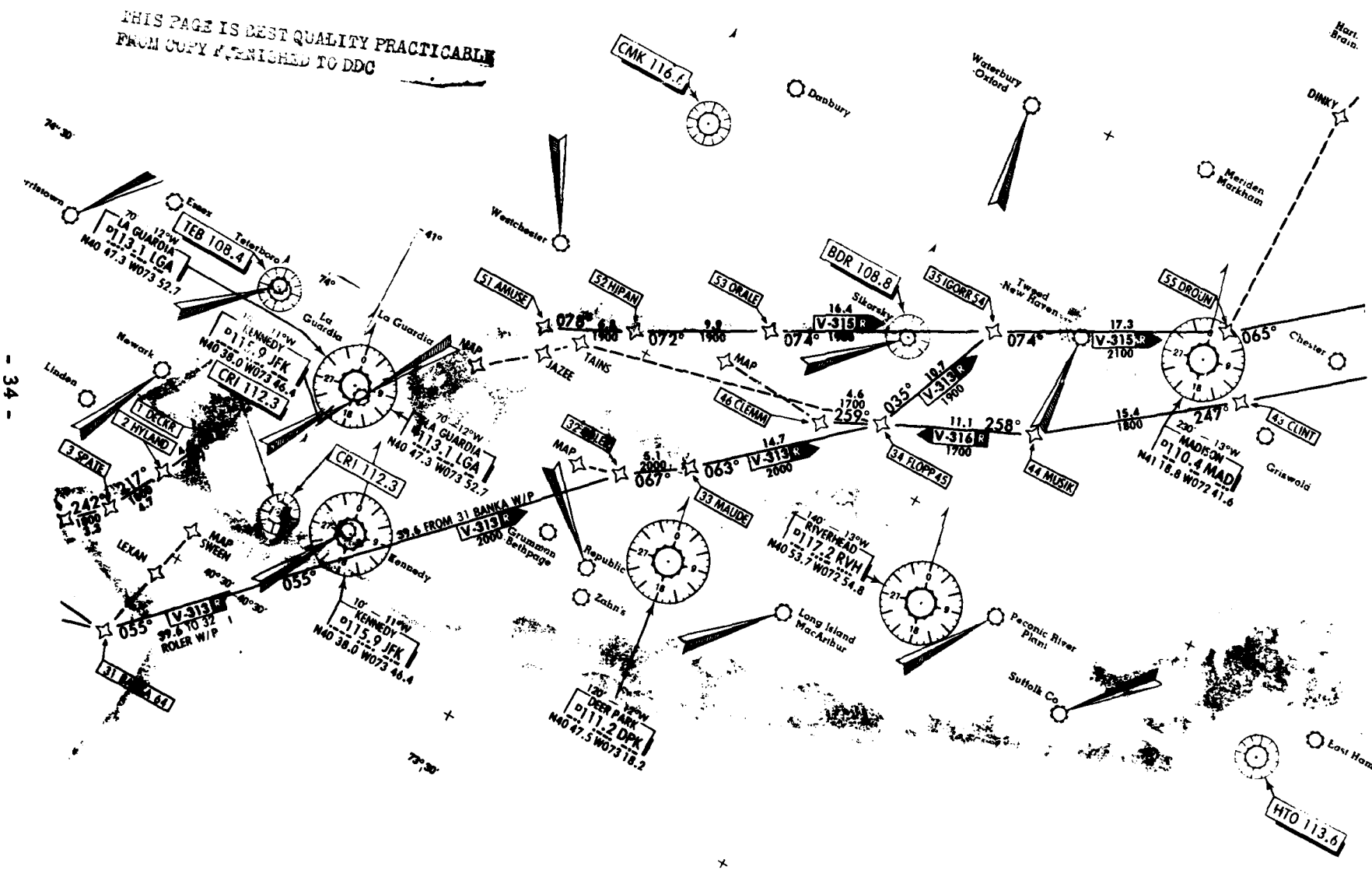
NO	NAME	IDENT	FREQ	ELEV	BEARING/DME DIST	VAR	LAT/LONG
46	TAYLO	EMI	117 9	08	075 0°/26 0	08W	N393947 6/W762744 3
48	RINTY	EMI	117 9	08	187 0°/13 3	08W	N391623 1/W765825 9

MAR 30 79 — Special Tailored

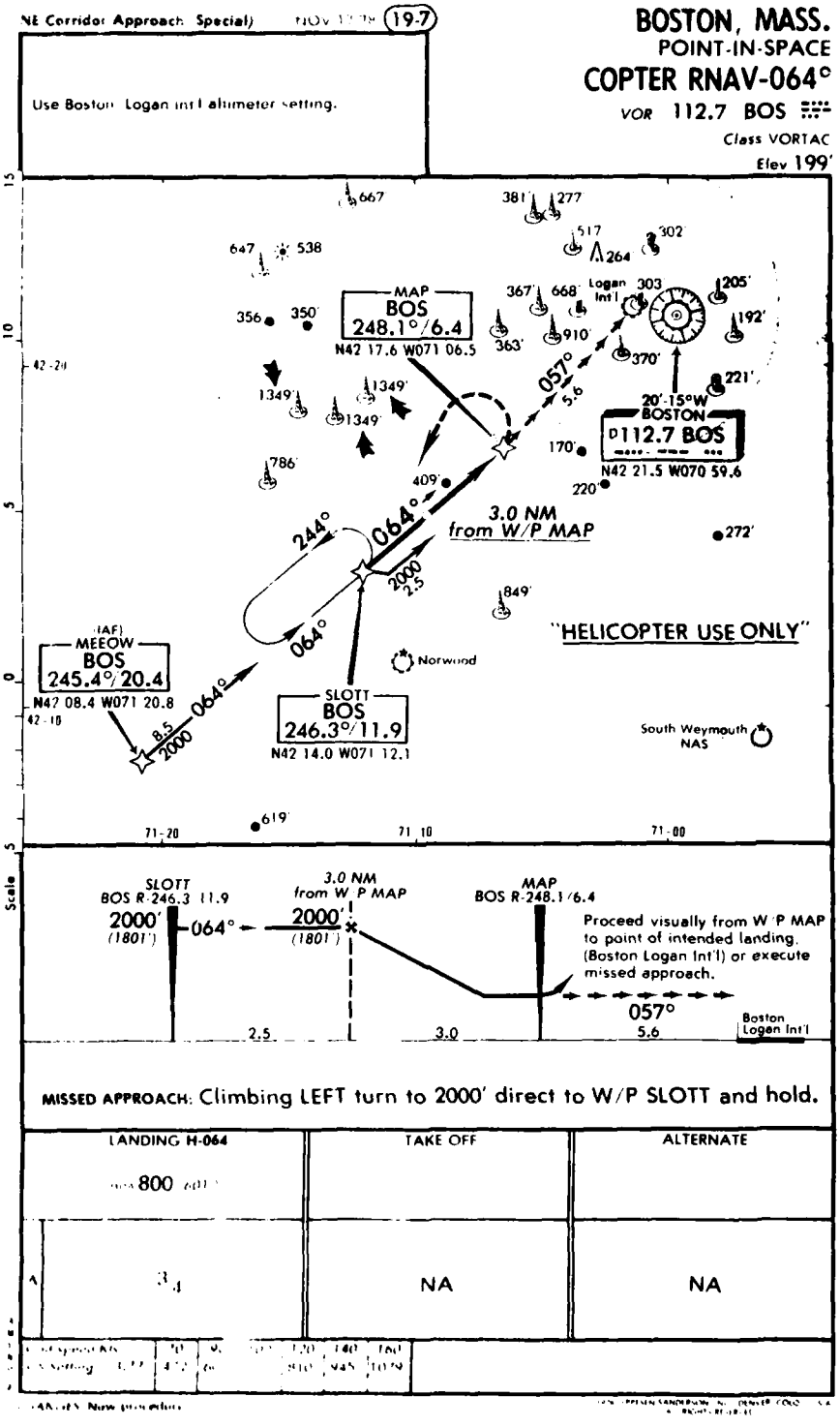
NORTHEAST HELICOPTER CORRIDOR ROUTES
(WASHINGTON D.C. TO NEW YORK CITY)

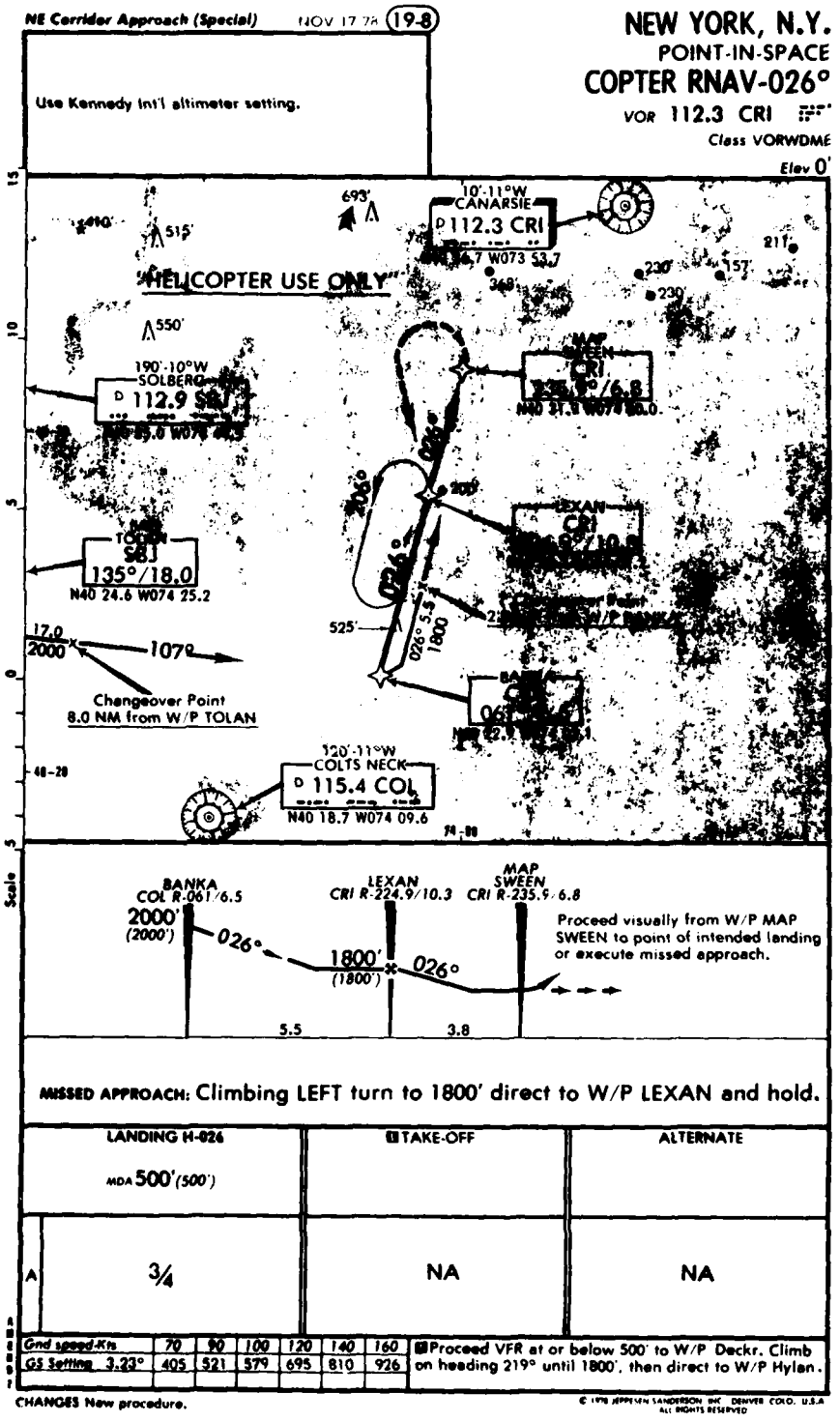



BWZ 114.2
SOLBERG
112.9 SBJ
N40 35.0 W074 44.5
Solberg Hunterdon
Somerset
Somerset Hills
Kupper
Sky Manor
Princeton
Old Bridge
COLTS NECK
115.4 COL
N40 18.7 W074 09.6
ROBBINSVILLE
113.8 RBV
N40 12.1 W074 29.7
Lakehurst NAEC
Trenton Robbinsville
GXU 110.6
McGuire AFB
CYN 113.4
ALLENTOWN
117.5 ABE
N40 43.6 W075 27.3
Allentown Queen City
Easton
Quakertown
Doylestown
YARDLEY
108.2 ARD
N40 15.2 W074 54.5
Mercer
Warminster NADC
Willow Grove NAS
Turner
Wings
PNE 112.0
North Philadelphia
Burlington
Red Lion
Pottstown
Pottstown Limerick
Perkiomen Valley
PTW 116.5
Philadelphia
Bridgeport
OOD 112.8
WOODSTOWN
113.2 MXE
N39 55.1 W075 40.3
NEW CASTLE
114.0 EWT
N39 40.4 W075 37.3
Greater Wilmington
The New Garden Flying Field
Chester County
General Spaatz
LANCASTER
117.3 LRP
N40 07.2 W076 17.5
Lancaster
Summit
Delaware
V-314
V-313
V-309
V-39
GYPSI




BOSTON
112.7 BOS
N42 21.5 W070 59.6
Logan
South Weymouth NAS
HTM 109.0
Plymouth
SHAGG
TO MAP
MAP
Hanscom
BOSSI
SLOTT
Norwood
41 ROGEE
Mansfield
Taunton
New Bedford
Fall River
247°
57 MEOW
Hopedale Draper
PROVIDENCE
115.6 PVD
N41 43.5 W071 25.8
North Central State
Worcester
32.1
V-315
2500
28.5
V-316
Green State
MOTZA
Newport State
Quonset State
42 MOURO
Southbridge
PUT 117.4
065.5°
Danielson
246°
56 DANET
ORW 110.0
Westerly State
Windham
TMU 111.8
Trumbull
Elizabeth
HFD 114.9
Bradley




NE Corridor Approach (Special)
NOV 17 78
19-8
NEW YORK, N.Y.
POINT-IN-SPACE
COPTER RNAV-026°
VOR 112.3 CRI
Class VORWDME
Elev 0'
Use Kennedy Int'l altimeter setting.
HELICOPTER USE ONLY
10°-11°W
CANARSIE
D 112.3 CRI
190°-10°W
SOLBERG
D 112.9 SBJ
TOLAN
SBJ
135°/18.0
N40 24.6 W074 25.2
MAP
SWEEN
CRI
LEXAN
CRI
BANKA
COL
120°-11°W
COLTS NECK
D 115.4 COL
N40 18.7 W074 09.6
17.0
2000
107°
Changeover Point
8.0 NM from W/P TOLAN
026°
5.5
1800
525'
693'
515'
550'
Scale
BANKA
COL R-061/6.5
LEXAN
CRI R-224.9/10.3
MAP
SWEEN
CRI R-235.9/6.8
2000'
(2000')
026°
1800'
(1800')
026°
5.5
3.8
Proceed visually from W/P MAP SWEEN to point of intended landing or execute missed approach.
MISSED APPROACH: Climbing LEFT turn to 1800' direct to W/P LEXAN and hold.
LANDING H-026
MDA 500'(500')
TAKE-OFF
ALTERNATE
A
3/4
NA
NA
Gnd speed-Kts 70 90 100 120 140 160
GS Setting 3.23° 405 521 579 695 810 926
Proceed VFR at or below 500' to W/P Deckr. Climb on heading 219° until 1800', then direct to W/P Hylan.
CHANGES New procedure.
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NE Corridor Approach (Special) NOV 17 78 (19-8)

PHILADELPHIA, PA.

POINT-IN-SPACE

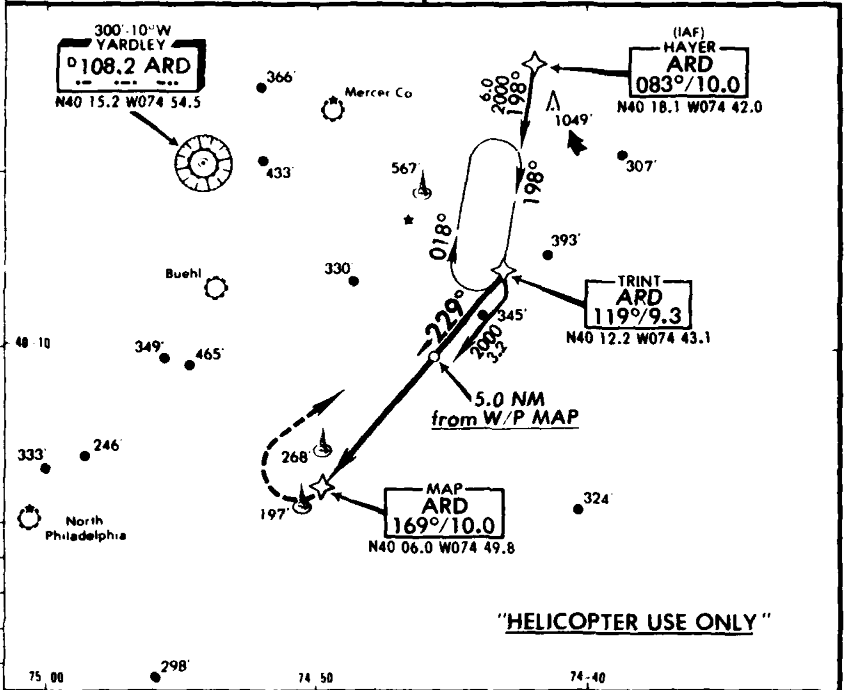
COPTER RNAV-229°

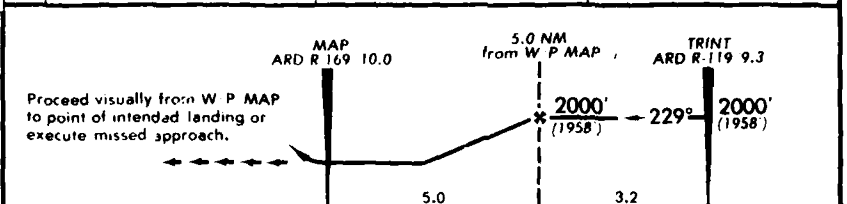
VOR 108.2 ARD

Class BVORTAC

Elev 42'

Use North Philadelphia altimeter setting.



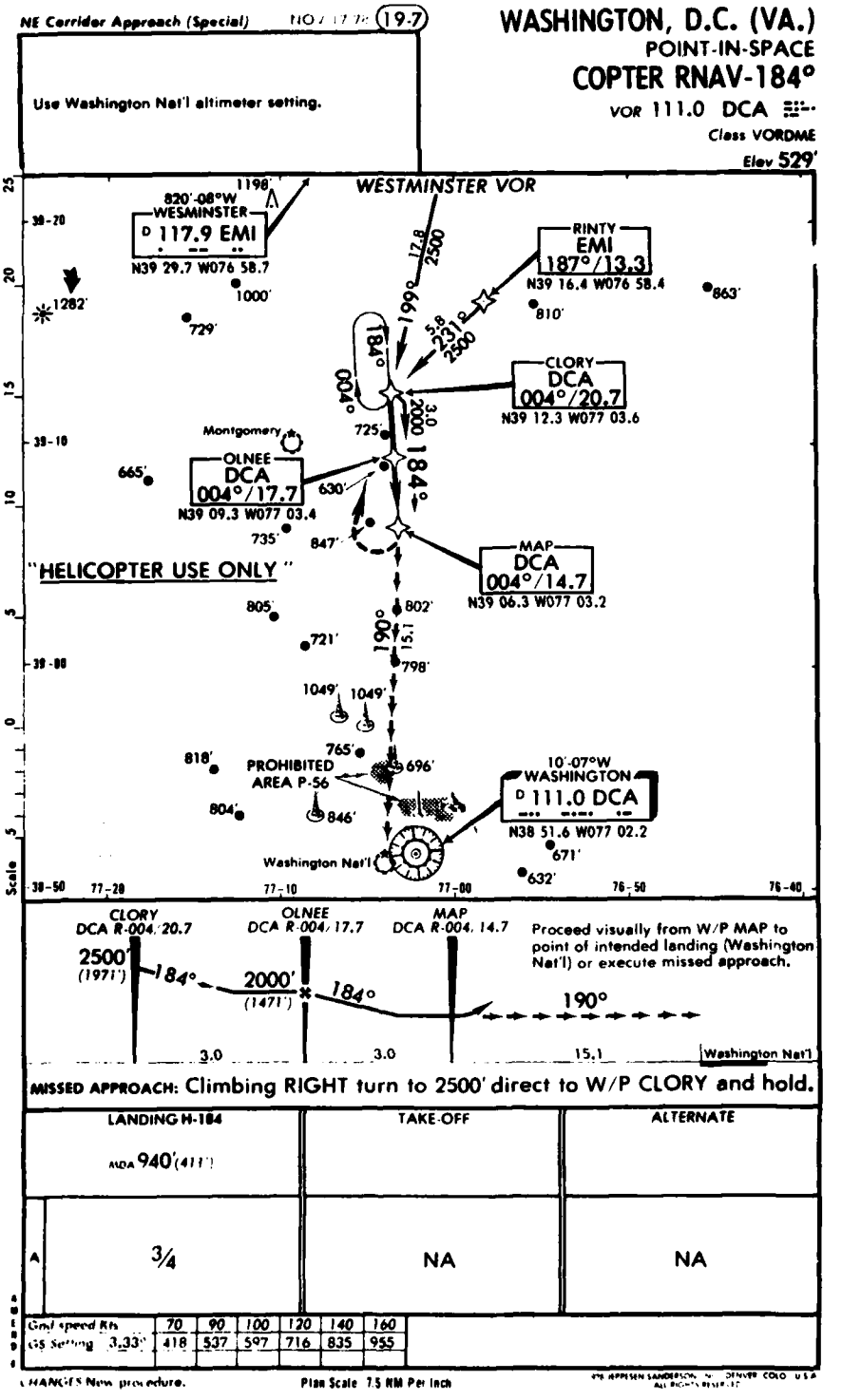


MISSED APPROACH: Climbing RIGHT turn to 2000' direct to W/P TRINT and hold.

	LANDING H-229	TAKE-OFF	ALTERNATE
	MDA 540'(498')		
A	3/4	NA	NA

Gnd speed-Kts	70	90	100	120	140	160
GS Setting 2.75°	346	444	494	593	691	790

CHANGES: New procedure


NE Corridar Approach (Special)
19-7
WASHINGTON, D.C. (VA.)
POINT-IN-SPACE
COPTER RNAV-184°
VOR 111.0 DCA
Class VORDME
Elev 529'
Use Washington Nat'l altimeter setting.
WESTMINSTER VOR
820'-08°W
WESMINSTER
D 117.9 EMI
N39 29.7 W076 58.7
RINTY
EMI
187°/13.3
N39 16.4 W076 58.4
CLORY
DCA
004°/20.7
N39 12.3 W077 03.6
OLNEE
DCA
004°/17.7
N39 09.3 W077 03.4
MAP
DCA
004°/14.7
N39 06.3 W077 03.2
"HELICOPTER USE ONLY"
PROHIBITED
AREA P-56
10°-07°W
WASHINGTON
D 111.0 DCA
N38 51.6 W077 02.2
Montgomery
Washington Nat'l
1198'
1282'
1000'
729'
863'
810'
725'
665'
630'
735'
847'
805'
802'
721'
798'
1049'
1049'
765'
696'
818'
804'
846'
671'
632'
199°
17.8
2500
184°
5.8
2300
2500
004°
2000
3.0
184°
190°
15.1
39-20
39-10
39-00
38-50
77-20
77-10
77-00
76-50
76-40
Scale
CLORY
DCA R-004, 20.7
2500'
(1971')
184°
OLNEE
DCA R-004, 17.7
2000'
(1471')
184°
MAP
DCA R-004, 14.7
190°
3.0
3.0
15.1
Washington Nat'l
Proceed visually from W/P MAP to point of intended landing (Washington Nat'l) or execute missed approach.
MISSED APPROACH: Climbing RIGHT turn to 2500' direct to W/P CLORY and hold.
LANDING H-184
TAKE-OFF
ALTERNATE
MDA 940'(411')
A
3/4
NA
NA
Gnd speed Kts
70
90
100
120
140
160
GS Setting 3.33°
418
537
597
716
835
955
CHANGES New procedure.
Plan Scale 7.5 NM Per Inch

Appendix C

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 11367, WASHINGTON, D.C.

POSTAGE WILL BE PAID BY ADDRESSEE

HELICOPTER ASSOCIATION of America
1156 15TH STREET, N.W., SUITE 610
WASHINGTON, D.C. 20005

NORTHEAST CORRIDOR EVALUATION PROJECT

IN-FLIGHT/POST-FLIGHT DATA LOG

DATE_____ ACID_____ PILOT_____

DEPARTURE PT_____ TIME_____Z

JOIN NEC @_____ W/P TIME_____Z

RTE OF FLT _____

INIT ATC CTC_____(APCH) TIME_____Z

INIT ALT_____MSL ASSG'D BCN CODE_____

FLT COND _____

EXIT NEC @_____ W/P TIME_____Z

APCH? YES_____ NO_____ TO _____ W/P, ARPT

TYPE _____ NO. (DESIG)_____

MAP WX _____

RTE DEV-ATC_____ WX_____ NAV_____ OTHER_____

EXPLAIN _____

_____

HOLD? NO_____ YES_____ @ _____W/P, FIX

TIME_____Z _____MINS

PATTERN _____

REMARKS _____

_____

_____

_____

Appendix C

NORTHEAST CORRIDOR EVALUATION PROJECT

IN-FLIGHT/POST-FLIGHT DATA RECORD

INSTRUCTIONS FOR FILLING OUT ABOVE FORM

ITEM NO.	LABEL	CONTENTS
1.-	DATE	ENTER DAY, MONTH AND YEAR TEST FLIGHT TAKES PLACE.
2.-	ACID	AIRCRAFT IDENTIFICATION- ENTER TAIL NUMBER OF HELICOPTER.
3.-	PILOT	ENTER NAME OF PILOT IN COMMAND.
4.-	DEPARTURE PT	ENTER POINT OF INITIAL DEPARTURE, AIRPORT, HELIPORT, FACTORY SITE ETC. IF POSSIBLE IDENTIFY IN RELATION TO A KNOWN SITE IF NOT READILY IDENTIFIABLE.
5.-	TIME	ENTER TIME OF ACTUAL DEPARTURE. ALL TIMES HEREAFTER MENTIONED TO BE EXPRESSED IN GREENWICH MEAN TIME (CIVIL UNIVERSAL TIME) IN THE TWENTY-FOUR HOUR CLOCK.
6.-	JOIN NEC @	ENTER LOCATION WHERE NEC IS INTERCEPTED. EITHER AT A WAYPOINT OR IN RELATION TO A WAYPOINT EG. 5 S. ZOIDS.
7.-	TIME	ENTER TIME NEC IS INTERCEPTED.
8.-	RTE OF FLT	ENTER FILED ROUTE OF FLIGHT AS PER FLIGHT PLAN. IF ROUTE FLOWN DOES NOT CORRESPOND WITH ROUTE SHOWN HERE PLEASE NOTE AND EXPLAIN IN REMARKS.
9.-	INIT ATC CTC	ENTER INITIAL CONTACT WITH THE APPROACH CONTROL WHICH WILL FIRST TRACK THE FLIGHT. EG. IF FLIGHT ORIGINATES IN McGUIRE APPROACH CONTROL AREA IT WILL BE INITIALLY TRACKED BY PHILADELPHIA APPROACH CONTROL. CONTACT PHILADELPHIA AND SO NOTE IN THIS SPACE.
10.-	TIME	ENTER TIME OF CONTACT WITH INITIAL TRACKING FACILITY.
11.-	INIT ALT	ENTER FIRST ASSIGNED ALTITUDE. IF ALTITUDE CHANGES ARE REQUIRED ENROUTE PLEASE NOTE IN REMARKS. IF VFR ENTER ACTUAL ALTITUDES FLOWN.
12.-	ASSG'D BCN CODE	ENTER DISCRETE BEACON (TRANSPONDER) CODE ASSIGNED BY ATC. NOTE ANY BEACON CODE CHANGES ENROUTE IN REMARKS.

13.-	FLT COND	ENTER ACTUAL WEATHER CONDITIONS ENCOUNTERED AT YOUR FLIGHT ALTITUDE DURING THE FLIGHT. THIS MAY BE SHOWN IN SEGMENTS. EG. ABZUG-HAMOR, CLEAR; PAOLI-TULLY, SCTD CLDS AT ALTITUDE: TULLY-BANKA, IN CLOUD.
14.-	EXIT NEC @	ENTER LOCATION WHERE FLIGHT DEPARTS NEC. EITHER AT WAYPOINT OR IN RELATION TO A WAYPOINT. IF STARTING POINT IN SPACE APPROACH THAT WILL BE SHOWN BELOW IN ITEM 16.
15.-	TIME	ENTER TIME OF DEPARTURE FROM NEC.
16.-	APCH ?	INDICATE YES OR NO IF ANY KIND OF APPROACH WAS MADE AFTER DEPARTING THE NEC.
17.-	TO	ENTER WAYPOINT OR AIRPORT TO WHICH APPROACH WAS MADE IF ANSWER TO ITEM 16 IS YES. IF POINT IN SPACE APPROACH IS MADE, ENTER LAST WAYPOINT PRIOR TO MISSED APPROACH WAYPOINT. IF AIRPORT APPROACH IS MADE ENTER AIRPORT NAME.
18.-	TYPE	ENTER TYPE OF APPROACH MADE. EG. P.I.S., ILS, VOR, ETC.
19.-	NO.(DESIG)	IDENTIFY APPROACH MADE. EG. COPTER RNAV-022
20.-	MAP WX	IF APPROACH ACCOMPLISHED ENTER ACTUAL WEATHER ENCOUNTERED AT MISSED APPROACH WAYPOINT OR MISSED APPROACH POINT.
21.-	RTE DEV	ENTER ANY DEVIATIONS OR DIVERSIONS FROM FILED ROUTE OF FLIGHT. CATEGORIZE THEM IF POSSIBLE AS TO CAUSE; ATC, NAV, WEATHER, OTHER.
22.-	EXPLAIN	ENTER REASON FOR DEVIATION FROM ROUTE. EG. ATC WOULD REFER TO A DEVIATION CAUSED BY AN APPROACH CONTROL VECTOR TO AVOID TRAFFIC. WX WOULD REFER TO A VECTOR INITIATED EITHER BY ATC OR PILOT REQUEST TO AVOID AN AREA OF PRECIPITATION. A DEVIATION MIGHT BE REQUIRED DUE TO A VORTAC OUTAGE ALONG THE ROUTE. ANY REASON THAT TAKES THE TEST HELICOPTER OFF THE FILED ROUTE MUST BE LOGGED FOR PROPER DATA INTERPRETATION.

23.-	HOLD?	COMPLETE THIS SECTION IF HOLDING HAS BEEN ACCOMPLISHED DURING THIS FLIGHT. CHECK YES OR NO. IF YES CONTINUE TO 24
24.-	@	IF ANSWER TO ITEM 23 IS YES, ENTER POINT AT WHICH HOLDING WAS ACCOMPLISHED. IF HELD ON NEC, ENTER WAYPOINT OR OTHER IDENTIFIABLE POINT, IF HELD OFF NEC, ENTER FIX.
25.-	TIME	IF HELD, ENTER TIME OF ENTRY INTO HOLDING PATTERN.
26.-	__MINS	IF HELD, ENTER TIME IN MINUTES SPENT IN HOLDING PATTERN.
27.-	PATTERN	IF HELD, DESCRIBE HOLDING PATTERN ASSIGNED. EG. RIGHT TURNS, ONE MINUTE LEGS.
28.-	REMARKS	USE THIS SECTION TO NOTE ANY OUT OF THE ORDINARY OCCURRANCES NOT COVERED IN THE CATEGORIES ABOVE. EG. FLIGHT NOT COMPLETED AS FILED DUE TO INFLIGHT CHANGE OF PLANS, NEW YORK COMMON IFR ROOM UNABLE TO TRACK DUE TO RECORDER OUTAGE, ETC.

Any questions on interpreting or completing the Log should be referred to:

Joseph D. Harrigan
Federal Aviation Administration
NAFEC ANA-310
Atlantic City, N. J. 08405
Tel: 609-641-8200 Ext 3905/3906

OR

Glen A. Gilbert
Helicopter Association of America
1156 16th Street. N. W.
Suite 610
Washington, D. C. 20005
Tel: 202-965-0765 or 202-466-2420

NORTHEAST CORRIDOR EVALUATION PROJECT

IN-FLIGHT/POST-FLIGHT DATA LOG

DATE 8/1/79 ACID N345T PILOT SMITH

DEPARTURE PT PRINCETON TIME 2010 Z

JOIN NEC @ HAYER W/P/TIME 2014 Z

RTE OF FLT V314R TAYLO

INIT ATC CTC EWR (APCH) TIME 2012 Z

INIT ALT 4000 MSL ASSG'D BCN CODE 5425

FLT COND 30 Ø 50 Ø 7

EXIT NEC @ TAYLO W/P/TIME 2105 Z

APCH? YES X NO ___ TO BWI ~~W/P~~, ARPT

TYPE PIS NO. (DESIG) RNAV-20S°

MAP WX 15 Ø 4

RTE DEV-ATC X WX X NAV X OTHER ___

EXPLAIN ATC - VECTOR 180° 2nm/DP BEKEL, TRAFFIC

HOLD? NO ___ YES X @ TAYLO W/P, ~~FIX~~

TIME 2100 Z 4 MINS

PATTERN 1 MIN RT TURNS

REMARKS WX - 5NE SIMON - 270°/180° REJOIN NEC 10 NE WAGGS (TSTM)

NAV - FLEW WAGGS DP TAYLO DUE LRP VTAC OUTAGE

SPECIMEN

HELICOPTER ASSOCIATION OF AMERICA
INTERNATIONAL
1156 15TH STREET, N.W., SUITE 610, WASHINGTON, D.C. 20005 202/466-2420 • TELEX 89-615

Appendix D

July 10, 1979

TO: All Participants and Interested Parties in the HAA/FAA NEC Evaluation Project.

FROM: Glen A. Gilbert - HAA Project Manager

BACKGROUND

This evaluation project is being conducted jointly by Federal Aviation Administration (FAA), Helicopter Association of America (HAA), The Northeast Corridor Operators Council and other participating helicopter operators utilizing the helicopter routes between Boston and Washington known as the Northeast Corridor Helicopter Routes.

The primary objective of this project is to determine the feasibility of discrete, reduced width, low altitude RNAV airways and RNAV Point in Space instrument approaches, and associated spurs and approaches for helicopter operations between Boston and Washington.

The Program will also provide FAA/HAA with data on:

1. Interfacing helicopter routes with fixed wing routes.
2. Navigational capability, radar and communications coverage along the NEC, its spurs and approaches.
3. Airway route width requirements.
4. Updating Terminal Instrument Procedures (TERPS) criteria for helicopters.
5. Development of inter-city IFR helicopter routes in other areas of the National Airspace System.

EVALUATION OUTLINE:

The evaluation period will cover approximately one year, commencing July 15, 1979.

Operational flights by participating helicopter operators along the Northeast Corridor (NEC), its spurs and approaches, will be the source of all data collected for this evaluation.

Data will be collected by ATC Terminal Facilities equipped

with Automated Radar Terminal Systems (ARTS) with data extraction capabilities.

The facilities providing data recording along the NEC are: Boston, Quonset Point, Bradley, New York, Philadelphia and Baltimore. Westchester and McGuire will participate but not track. Flights may also work Newark approach but tracking will be provided by New York. Each participating operator will be provided with a list of contacts at the tracking facilities for alerting purposes (Attachment "A").

Participating operators are requested to fill out and return to the HAA Parts I & II of the enclosed "Data Sheet". (Attachment "B"). Prospective operators are requested to fill out and return to the HAA PART III of the enclosed Data Sheet (Attachment "B").

Participating flight crews will be furnished with a supply of an In-Flight/Post-Flight Data Log. This log will aid in correlating flight and tracking data and will be referred to later.

ALERTING-FLIGHT PROCEDURES

Prior to each evaluation flight, the operator will alert the Approach Control Facility Watch Supervisor in whose area the flight originates or will initially penetrate. This alert notice should be given as far in advance of the flight as possible. Operators who run schedules should forward that schedule to the above facility when available. If Notice of Flight had been given more than two hours prior to departure renotify the facility fifteen minutes before takeoff.

Initial Facility Notification Should Include:

1. A/C Ident and type.
2. Departure Point.
3. Estimated Time of Departure.
4. Route of Flight
5. Destination.
6. Requested Altitude.
7. This is a NEC test flight, request track recording.

Upon initial radio contact only, advise controller of test status and confirm that track recording is in progress. (Advise N. Y. Center of status for logging only.)

Those flights originating in the New York area will be tracked and recorded automatically but must still advise N. Y. Common IFR Room of status as test participant so facility may log flight and retrieve data. N. Y. records constantly.

Once in the Terminal Enroute System the flight will be tracked until it lands or departs the Northeast Corridor, its spurs or approaches. No further notification is necessary as flight proceeds from one approach control to another. Interfacility coordination will be handled by the controlling facilities.

Flights will be tracked as long as they are in radar contact even though the flight may be in contact with a non tracking facility (I. E., McGuire, Westchester). Facilities on either side will bridge the gap.

The test helicopter will be treated as any other operational flight and special handling will not be provided nor should it be requested.

All test participants must file a Standard IFR flight plan and include "NEC Test" in remarks. Test flights may be made under both actual IFR and VFR weather conditions, providing flight plan is filed as above. Participating pilots are encouraged to file an NEC Test IFR flight plan as often as feasible in order that the FAA and HAA can acquire a sufficient data base to permit meeting the objectives of the project.

DATA RECORDING (AIRBORNE)

All operators participating in the NEC evaluation project will be provided with In-Flight/Post-Flight Data Logs as previously mentioned This log must be filled out during or after each flight to enable data reduction personnel to correlate the flight with the recorded data and to differentiate any ATC or operator initiated diversions from navigational system induced course deviations. These logs should be forwarded to the HAA daily. Note that on the reverse side they are self-addressed with a postal permit (no stamp required). This evaluation project is designed so that no interference with normal day to day operations should occur. The only requirements are that the pilot notify ATC and forward the completed Flight Data Log. To assist participating pilots

in completing the Log format, enclosed as Attachment "C" is a marked-up Sample Log together with a related explanation sheet.

Since this evaluation is being conducted in a totally operational environment, it is to be expected that not all flights will be tracked at all times. It is recognized that at times notification will not be timely and also that the tracking capability of the facilities is not always available. However, a substantial amount of data should be retrieved if the procedures described herein are closely adhered to by all participants

Glen A. Gilbert
HAA NEC Project Manager

GAG:md

Appendix E

HAA/FAA NORTHEAST CORRIDOR PROJECT

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	Don Pettito	DSS	223-4554	617-223-4554
	Fred Wood	PPS		
QUONSET POINT	Raleigh Beach	A/C	838-4491 */#	401-528-4491/*/#
TRACON	Bob Viera	DSS	" "	401-884-2620
BRADLEY	Watch Supervisor		244-2013 */#	203-623-8366 *
TRACON	George Langdon	OPS	" "	203-623-4282 #
NEW YORK	Newark Sector			800-221-6910 *
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	Dick Sutter		665-9540	212-995-9540
				212-995-5120
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RAPCON	Bruce Ware	OPS	596-1956 */#	215-596-1955/6 #
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\# During Duty Hours 0800 - 1630
* Other than Duty Hours 1630 - 0800

ADVISORY CIRCULAR

DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
Washington, D.C.

Subject: IFR HELICOPTER OPERATIONS IN THE NORTHEAST CORRIDOR

1. PURPOSE. This circular advises interested users of special Area Navigation (RNAV) helicopter routes between Washington, D.C., and Boston, Massachusetts, (known as the "Northeast Corridor") and provides guidelines to operators for the safe use of these routes. The use of these routes is voluntary.

2. BACKGROUND. The Federal Aviation Administration (FAA), in conjunction with the Helicopter Association of America (HAA), established a pilot project in mid-1974, in the Northeast Corridor, which was designed to demonstrate the feasibility of instrument flight rules (IFR) helicopter operations in high density traffic areas with minimum impact on or from fixed wing traffic, or with the air traffic control system. The route selected was from Washington, D.C. to Boston, Massachusetts, via Philadelphia, Pennsylvania, and New York, New York, with numerous feeders, spurs and RNAV instrument approach procedures, including both onshore and offshore environments. The Northeast Corridor is considered a dynamic route structure with additions or changes to be made as required. Experience gained will serve as the basis for national application.

a. The Northeast Corridor routes have a minimum altitude as low as 1700 feet above ground level (AGL) with a maximum authorized altitude of 5000 feet mean sea level (MSL). This eliminates coordination with Air Route Traffic Control Centers, and uses approach control services throughout the entire route. The corridor is predicated on the use of RNAV which, at the present time, is described with reference to VOR/DME facilities, although other systems such as Loran C, Omega, or VLF may be used as outlined in FAA Advisory Circular 90-45A, "Approval of Area Navigation Systems for Use in the U.S. National Airspace System." Two one-way routes have been established which will assure safety for opposite direction traffic at the same altitudes, when the guidance in this advisory circular is followed.

Initiated by: ATF-4

b. RNAV instrument approaches to a landing area or to a point-in-space are part of the Northeast Corridor concept. RNAV routes will terminate in a helicopter RNAV or conventional instrument approach procedure. Conventional instrument approaches may also be used at a destination airport. The RNAV point-in-space approach permits a descent to a designated point, and upon reaching visual contact at or above the minimum descent altitude, will permit proceeding under visual flight rules (VFR) or special VFR (SVFR) to the desired landing point. The point-in-space approach will only be utilized under weather conditions that permit air traffic control to accommodate it.

c. In establishing the Northeast Corridor concept, many facets were considered and examined such as: noninterference with airways; navigation coverage along routes and for approaches; radar and communications coverage; minimum en route altitudes (MEA); facility performance at low operational altitudes; video map accuracy for radar surveillance; adequacy of holding pattern airspace areas; route widths; impact on air traffic control services, instrument approaches, missed approaches, and departure approaches.

d. One of the major considerations in this project is the route width of the discrete helicopter RNAV airway structure. In order to effectively construct the Northeast Corridor concept, a ± 2 mile route width was necessary in order to fit this structure into the airspace without affecting established airways. In so doing, an important factor in conventional airway structuring had to be minimized. This factor is known as Flight Technical Error (FTE), and is a measure of the accuracy with which the pilot/autopilot can adhere to the prescribed track. In permitting this factor to be minimized, this advisory circular provides acceptable means of ensuring that users of this structure can safely use the Northeast Corridor system. A pilot operating IFR on this structure with improper equipment or inadequate pilotage technique could disrupt air traffic operations along the conventional airway system and possibly necessitate cancellation of the helicopter route. In addition to the route width reduction, the RNAV holding pattern airspace on this route is smaller than holding pattern airspace required for conventional aircraft.

e. It was considered desirable to develop special routes consistent with conventional traffic flow that could be used by helicopters under IFR conditions. As a result, the FAA has designed a route which would closely parallel conventional routes and has the potential for improving service for IFR helicopter operations. Subsequently, flight checks of sections of the proposed corridor were accomplished by conventional aircraft and finally by helicopter. Procedures for en route and approach capability were proposed and verified by flight check. The entire route was completed for area navigation rho-theta authorization in January 1978, although some segments were approved as early as 1975.

f. A preliminary environmental review (FAA Facility Management Handbook, 7210.3D, paragraph 11) has been completed on the Northeast Corridor

routes and procedures. This review does not indicate a requirement for further consideration of environmental impacts of this program.

3. KEY ITEMS.

a. Sections 91.116; 91.119; and 91.123, Part 91, of the Federal Aviation Regulations contain requirements concerning takeoff and landing, minimum altitudes, and course to be flown that must be complied with under IFR "unless otherwise authorized by the Administrator." In the interest of the safe and efficient expansion of helicopter operations, the Administrator hereby authorizes deviation from the cited regulations to the extent needed to permit helicopter operation on the Northeast Corridor routes, for operators who show that they meet the acceptable safety criteria in paragraph 4 of this advisory circular.

b. To insure that only authorized operators will utilize this corridor, public use en route or approach charts will not be issued until the route has been designated for public use. In the meantime, the FAA will issue written descriptions of the en route and approach procedures, and the operator can arrange for his own charts as desired. Such charts, however, should be made available to the respective FAA region for review. (Note: Several operators have joined forces to print charts. For further information on availability of these charts, contact the Helicopter Association of America.)

c. Routes will be designated with the letter "R" as is done for all other RNAV routes, e.g., V315R.

d. IFR helicopter operations on the Northeast Corridor will not necessarily receive radar vectoring. It is, therefore, assumed that authorized IFR helicopter operations on Northeast Corridor routes will follow the prescribed discrete routing with precision and without radar vectoring. It should be noted, however, that due to the complexities of the New York area, operations in this segment will be monitored by air traffic control.

e. In establishing the initial structure, it was deemed necessary to establish a considerable number of waypoints due to the complexity of the corridor and to minimize flight technical error. Frequent bearing changes are necessary to minimize corridor interrelation with established routes and airways. As experience dictates, it is expected that the corridor can be redesigned in some areas, thereby reducing the number of waypoints. During this initial period, however, it is considered undesirable to make changes in the prescribed route due to necessary follow-on requirements such as changing approach control video maps, special notification to users, and resultant changes in their operating charts; and the need for special flight checks to assess obstacle clearance, signal coverage and establishment of precise coordinates.

f. Waypoints are identified by name, reference facility with rho-theta information as well as latitude and longitude. Minimum and maximum en route altitudes between waypoints are provided as well as distances and changeover point information.

g. Area Navigation approaches in addition describe the minimum descent altitude, missed approach instructions, and holding patterns. Point-in-space approaches are not limited by distance from the point-in-space to the point of intended landing; however, they will normally be in close proximity to a landing area. Point-in-space approach procedures will identify the available landing area or areas in the vicinity by course and distance from the missed approach point.

h. Each of the major cities along this route has been assigned a point-in-space for both the northbound and southbound segment. It is expected that operators will utilize this point for operations within the local area. It will be the operator's responsibility for complying with Federal Aviation Regulations for VFR flights beyond the point-in-space, and to obtain a Special Visual Flight Rule from the appropriate air traffic control facility when weather so requires before operating in a control zone. The route of flight from the point-in-space to the intended point of landing should also be provided to air traffic control.

i. Helicopter point-in-space or direct airport approach procedures have been established for the following locations: Boston, Providence, Hartford, New York, Philadelphia, Bedford, Beverly, Baltimore, and Washington.

4. ISSUANCE OF AUTHORIZATION.

a. The sensitivity of the Northeast Corridor structure during the early phases, and recognition that authorization is required to assure that the Northeast Corridor routes are properly used, precludes advertising the Area Navigation waypoints and approach/departure procedures for general use.

b. Upon request to the appropriate FAA authorities identified below in paragraph 5, an operator who meets the necessary criteria may be granted authorization to utilize this corridor. Applicants should show that the following criteria have been met:

(1) The helicopter(s) to be used are certificated for IFR.

(2) The helicopter(s) are equipped with RNAV equipment approved for en route, terminal area, and approaches in accordance with AC 90-45A.

(3) Pilots operating within this corridor are IFR helicopter rated, and pilot technique is adequate to fly RNAV under IFR conditions within the confines of the corridor. This condition can be satisfied by having an operator designate one pilot

who will be checked by the local General Aviation District Office (GADO) (if they consider this to be necessary) as to competency in RNAV IFR flight. This should be a short simulated IFR RNAV flight on a conveniently selected portion of the Northeast Corridor route structure, and an Area Navigation approach procedure. Thereafter, it will be the responsibility of the operator's FAA approved and designated pilot to check-out the operator's other pilots who will fly the Northeast Corridor.

c. When the regional Flight Standards Division is satisfied that the operator meets all criteria, they will issue a letter of authorization which will be given in the name of the company and will list authorized aircraft registration numbers and authorized check pilot's name. All pertinent information on the route, waypoints, approach procedures, holding patterns, etc., as provided by the Air Traffic Division will be included. This will provide the basis for the operator to prepare or have prepared the necessary en route and approach charts (see paragraph 3.a.). These charts will be reviewed by the FAA.

d. Authorized operators are encouraged to file IFR flight plans on all Northeast Corridor operations, regardless of weather, in order to promote crew competency and familiarity by the air traffic controllers with their operations, and provide an effective data bank for route analysis and evaluation.

5. HOW TO INITIATE AUTHORIZATION.

a. Interested operators initially should contact the appropriate regional Air Traffic Division and request consideration for authorization. Such request should contain the area in which they wish to operate and confirmation of data outlined under paragraph 4 of this advisory circular.

b. The regional Air Traffic Division will coordinate the request with the Air Traffic Service and also with the regional Flight Standards Division, in order that Flight Standards may perform any equipment or flight check they deem necessary.

c. The Air Traffic Division will advise all authorized users of any changes or modifications on this route. Contacts are:

(1) Eastern Region - Washington to Hartford, Connecticut, contact

Federal Aviation Administration
JFK International Airport
Jamaica, New York 11430
(Telephone: 212-995-3392)

(2) New England Region - Hartford, Connecticut, to Boston, Mass. contact:

Federal Aviation Administration
12 New England Park
Burlington, Massachusetts 01830
(Telephone: 617-273-7286)

6. FUTURE PLANS.

a. Monitoring of corridor operations will be accomplished by the FAA for a one year period to obtain technical data on aviation system accuracy, under typical IFR helicopter operating conditions. Systems Research and Development Service, National Aviation Facilities Experimental Center, and the regional facilities in support of the Air Traffic and Flight Standards needs will collect data using the Automated Radar Terminal System (ARTS-III) terminal radar tracking and data collection. National Aviation Facilities Experimental Center will conduct data reduction and analysis in order to report the results of system performance by the Northeast Corridor users.

b. FAA is evaluating the Northeast Corridor structure utilizing Loran C, Omega, VLF, and airborne radar equipment for compatibility, performance and accuracy within this system. If these systems are found to be suitable during this evaluation, expanded use of this equipment will be considered for use along the corridor as appropriate for en route, terminal, or approach operations.

c. Results from this project are expected to be of material help in the future development of all weather helicopter operations in the national airspace system.

William M. Flener

WILLIAM M. FLENER
Associate Administrator for
Air Traffic and Airway Facilities, ATF-1

[4910-13-M]

Title 14—Aeronautics and Space

CHAPTER I—FEDERAL AVIATION ADMINISTRATION, DEPARTMENT OF TRANSPORTATION

[Docket No. 14237; SFAR No. 29-2]

PART 21—CERTIFICATION PROCEDURES FOR PRODUCTS AND PARTS

PART 27—AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY AIRPLANES

PART 29—AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY ROTORCRAFT

PART 91—GENERAL OPERATING AND FLIGHT RULES

Special Federal Aviation Regulation No. 29-2; Limited IFR Operations of Rotorcraft

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: This amendment reissues a special regulation which allows for limited operations under instrument flight rules (IFR) of certain transport category rotorcraft that are limited by their type certificates to operations under visual flight rules (VFR). It also amends the provisions of the special regulation by including Part 27 rotorcraft operations and deleting the airspace restrictions. The amendment is necessary to provide time for further study to determine whether the airworthiness requirements should be revised.

EFFECTIVE DATE: January 3, 1979.

FOR FURTHER INFORMATION CONTACT:

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SUPPLEMENTARY INFORMATION: Under Part 27 or 29 of the Federal Aviation Regulations (FAR) a rotorcraft is certificated for VFR operation only, unless it has been shown that the rotorcraft fully complies with all of the airworthiness requirements for IFR operations. The FAA believes that certain IFR operations can be safely conducted with rotorcraft that do not meet all of the present flight characteristic requirements. Special Federal Aviation Regulation (SFAR) No. 29 was adopted to provide for the issue by the Administrator of approvals for this relief on an interim basis pending the conclusion of a study to determine whether a "limited" IFR category should be established for these rotorcraft, including flight characteristics and equipment requirements, operating procedures and limitations, flight crew requirements, and training requirements. The expiration date of SFAR No. 29 as amended by SFAR No. 29-1 (41 FR 1060), is December 31, 1978.

The FAA has established a Rotorcraft Regulatory Review Program which will involve a comprehensive review and upgrading of rules regarding rotorcraft airworthiness standards and operating requirements. This program will consider the development of IFR airworthiness standards for rotorcraft certification in Parts 27 and 29 of the FAR. This program will not be concluded by the December 31, 1978, termination date of SFAR No. 29.

The FAA has been requested by the Helicopter Association of America on behalf of their membership to consider including certain helicopters certificated to the airworthiness standards of Part 27 to allow IFR operations similar to those conducted under SFAR 29. In addition, it was requested that the airspace restrictions be deleted. Based upon the study results to date and the need to collect additional data, the FAA has determined that the requirement for specific approval of IFR routes and area of operation could be deleted without jeopardizing safety. The present IFR study provisions of SFAR 29 have not included Part 27 helicopters which are being used in pilot training programs leading toward instrument ratings in rotorcraft-helicopters. In addition, a number of these helicopters, operating VFR, presently require, under the interim standards for IFR certification, stringent and costly stability augmentation devices to be added to the flight control system before operating in instrument meteorological conditions. The need exists to expand the IFR study to include certain helicopters certificated to the airworthiness standards of Part 27 and evaluate the need for stability devices prior to imposing a large financial burden upon the industry.

In a continued effort to expand the data base of operational information, the FAA has, therefore, determined it advisable to amend SFAR 29 to delete the airspace restrictions and to include certain helicopters certificated to the airworthiness standards of Part 27.

If SFAR No. 29 were not to continue in effect until the completion of the rulemaking action generated by the Rotorcraft Regulatory Review Program, an undue burden could be placed on certain operators of helicopters meeting the criteria specified in SFAR No. 29 because it would prohibit IFR operations with those helicopters which might be allowed when the Rotorcraft Regulatory Review Program is completed. Thus, the FAA believes that it is in the public interest to allow IFR operations with certain rotorcraft that do not meet all of the present requirements of Parts 21, 27, 29, and 91 of the FAR pending a determination of whether or not new standards should be developed.

The expansion and effectivity of SFAR No. 29 to December 31, 1980, should provide the FAA sufficient time to determine what regulatory changes are necessary.

RULES AND REGULATIONS

Adoption of the Amendment

Since this amendment temporarily relieves a restriction in connection with operations conducted as part of an FAA study and imposes no additional burden on any person, I find that notice and public procedure are unnecessary and that good cause exists for making this amendment effective in less than 30 days.

Accordingly, Special Federal Aviation Regulation No. 29, as amended by SFAR No. 29-1, is reissued, effective January 3, 1979, to read as follows:

Special Federal Aviation Regulation SFAR No. 29-2

1. Contrary provisions of Parts 21, 27, and 29 of the Federal Aviation Regulations notwithstanding, an operator of a rotorcraft that is not otherwise certificated for IFR operations may conduct an approved limited IFR operation in the rotorcraft when—

(As published in the Federal Register (44 F.R. 2362) on January 11, 1979)

(a) FAA approval for the operation has been issued under paragraph 2 of this SFAR;

(b) The operator complies with all conditions and limitations established by this SFAR and the approval; and

(c) A copy of the approval and this SFAR are set forth as a supplement to the rotorcraft flight manual.

2. FAA approval for the operation of a rotorcraft in limited IFR operations may be issued when the following conditions are met:

(a) The operation is approved as part of the FAA study of limited rotorcraft IFR operations.

(b) Specific FAA approval has been obtained for the following:

(i) The rotorcraft (make, model, and serial number).

(ii) The flight crew.

(iii) The procedures to be followed in the operation of the rotorcraft under IFR and the equipment that must be operable during such operations.

(c) The conditions and limitations necessary for the safe operation of the rotorcraft in limited IFR operations have been established, approved, and incorporated in the operating limitations section of the Rotorcraft Flight Manual.

3. An approval issued under paragraph 2 of this Special Federal Aviation Regulation and the change to the Rotorcraft Flight Manual specified in paragraph 2(c) of this Special Federal Aviation Regulation constitute a supplemental type certificate for each rotorcraft approved under paragraph 2 of this SFAR. Each approval issued under this SFAR terminates on December 31, 1980, unless sooner suspended, rescinded, or otherwise terminated by the Administrator.

4. Notwithstanding § 91.23(a)(3) of the Federal Aviation Regulations, a person may operate a rotorcraft in a limited IFR operation approved under paragraph 2(a) of this Special Federal Aviation Regulation with enough fuel to fly, after reaching the alternate airport, for not less than 30 minutes, when that period of time has been approved.

This Special Federal Aviation Regulation terminates on December 31, 1980, unless sooner superseded or rescinded.

(Sections 313(a), 601(a), and 603 of the Federal Aviation Act of 1958 (49 U.S.C. 1354(a), 1421(a), and 1423) and section 6(c) of the Department of Transportation Act (49 U.S.C. 1655(c)).)

The Federal Aviation Administration has determined that this document is not significant in accordance with the criteria required by Executive Order 12044, and set forth in the proposed "Department of Transportation Regulatory Policies and Procedures" published in the FEDERAL REGISTER June 1, 1978 (43 FR 23925).

Issued in Washington, D.C., on January 3, 1979.

LANGHORNE BOND,
Administrator.

[FR Doc. 79-827 Filed 1-10-79; 8:45 am]

HELICOPTER ASSOCIATION of America

1156 15th St., N.W., Suite 610, Washington, D. C. 20005 (202) 466-2420 Telex 89615

July 16, 1979

NOW, SINGLE PILOT IFR AUTHORIZATION FOR VFR CERTIFICATED HELICOPTERS POSSIBLE UNDER SFAR 29-2. READ ON!!

TO: All HAA Regular, Associate and Sustaining Principals

FROM: Vincent Colicci, President

SUBJECT: Approval Procedures for Operations Under Special Federal Aviation Regulation (SFAR) No. 29-2

The Federal Aviation Administration (FAA) on July 12, 1979, issued a Notice (8710.2) to its various Flight Standards Offices, including General Aviation District Offices (GADO's), providing guidance to field personnel for approving operations under Special Aviation Regulation (SFAR) No. 29-2.

A. SFAR No. 29-2 became effective on January 3, 1979. SFAR No. 29 was originally promulgated in 1975 to enable the FAA to gain IFR experience with helicopters not meeting the then-existing IFR flight-handling qualities criteria. SFAR No. 29 expired on December 31, 1975, but was extended by SFAR No. 29-1 to December 31, 1978. SFAR No. 29-2 extends the expiration date to December 31, 1980, in order to provide time for further study to determine whether the airworthiness requirements should be revised. Only two operators applied and were approved to operate under SFAR No. 29 and SFAR No. 29-1. Only three additional operators have applied and been approved to operate under SFAR No. 29-2.

B. The Notice referred to above applies to the implementation of SFAR No. 29-2 which allows for limited operations under the instrument flight rules (IFR) of certain helicopters that are limited by their type certificates to operations under visual flight rules (VFR). Additionally, the appropriate provisions of FAR Part 135 are applicable to operations conducted under that part by operators authorized to conduct operations under SFAR No. 29-2.

C. Implementation:

a. An application (letter) for approval under SFAR No. 29-2 should be submitted to the GADO/FSDO having jurisdiction over the area in which the applicant's principal business office is located. Present operators that have been approved need not reapply. However, new letters of approval may be issued, when necessary, to authorize the provisions of this notice.

b. The application must identify each rotorcraft to be used under the approval by make, model, and serial number. Each rotorcraft must be type certificated under FAR Part 27 or FAR Part 29 and must meet all the instrument and equipment requirements of FAR Part 91, Section 91.33.

c. Except as provided in paragraph d, the minimum flightcrew must include a pilot in command (PIC) and a second in command (SIC). A complete set of flight controls must be available at each pilot station. Both pilots must hold rotorcraft-helicopter and instrument-helicopter ratings.

d. Single pilot operations may be approved for those aircraft type certificated for a crew of one under VFR conditions if the installations include compensating features, such as a stability augmentation system (SAS) and/or autopilot. Such an approval will require only one set of flight controls. Single pilot operations shall not be authorized in terminal control areas.

e. Operations may be approved for the purpose of instrument flight instruction with PIC's that are appropriately rated to instruct instruments in helicopters, and an SIC that holds at least a private pilot certificate with a rotorcraft-helicopter rating. Passenger carrying is prohibited during instructional operations; however, a third crewmember undergoing instrument training may be carried as an observer. A complete set of flight controls must be available at each pilot station.

f. Each applicant will be required to establish a pilot competency program. It must ensure that each pilot has sufficient proficiency to satisfactorily complete the initial instrument competency check specified in paragraph g. Additionally, it must ensure that each pilot understands the provisions and limitations of : SFAR No. 29-2, the flight manual supplement, the letter of authorization, and the data and procedures needed to complete the SFAR No. 29-2 Questionnaire. (See Section D.)

g. Each PIC will be required to complete an initial instrument competency check in each type rotorcraft authorized, and subsequent 6-month instrument checks in at least one of the rotorcraft in which he is authorized to operate under the SFAR. The PIC using compensating features, such as a SAS or autopilot in lieu of an SIC, must demonstrate competency using these features. This demonstration must be accomplished each 6 calendar months. Initial and recurrent instrument competency checks conducted by FAA inspectors or designated company check pilots under Part 135 are acceptable to meet the instrument competency check requirements of this paragraph. The instrument competency checks, for those operations not conducted under Part 135, must be conducted by FAA inspectors.

h. In accordance with SFAR No. 29-2, a copy of the FAA approval and a copy of the SFAR itself must be set forth as a supplement to the rotorcraft flight manual. In addition, the conditions and limitations deemed necessary for safe operation of the rotorcraft in IFR operation must be incorporated in the operating limitations section of the rotorcraft flight manual. This will require involvement of regional engineering and manufacturing personnel.

(1) Accordingly, a joint operations/engineering evaluation of the proposed flight envelope and equipment installation will be conducted in order to comply with paragraph 2c of the SFAR. The evaluation will include as a minimum:

(a) A qualitative evaluation of the proposed flight envelope (center of gravity, airspeed, altitude, rate of climb/descent, gross weight). The aircraft shall be free of rapid or excessive divergence within the flight envelope.

(b) Night flight.

(c) Flight in actual instrument meteorological conditions (IMC).

(d) Flight in turbulence.

(e) Failure conditions (hydraulic, electric, engine).

(f) Preparation of a Type Inspection Report to document the results of the evaluation.

(2) Equipment must include:

(a) An independently powered standby attitude indicator. The independent power source may be a backup electrical system, standby battery, vacuum , or bleed air source. (Attitude indication must be provided to make a safe landing from maximum IFR operational altitude after a total systems failure.)

(b) A heated pitot tube and static port, or equivalent means of preventing airspeed and static system malfunction due to icing.

(c) The required instruments per FAR 27.771 and 27.1321, or FAR 29.771 and 29.1321, as appropriate. (For dual pilot approvals, the instruments for the second pilot shall be determined during the certification program.)

(d) The pilot in command must use a boom mike. The transmitter must be capable of being activated through a device located on the flight controls.

(e) For single pilot operation, a stability augmentation system and/or autopilot system that is capable of maintaining flight of the helicopter about the three axes is required. The application must contain the make, model, and registration number of each helicopter in which a SAS and/or autopilot is installed, and the make and model of each SAS and/or autopilot installed.

(f) For night IFR operations, a standby power source for lighting the flight instruments and required radio communication/navigation equipment in the event of electrical system malfunction.

i. It should be noted that SFAR No. 29-2, paragraph (c)4, contains a relaxatory provision for fuel required for flight in IFR conditions, which must be specifically addressed in a Letter of Approval, if it is to be applied.

D. IFR Study:

SFAR No. 29 was adopted as an interim measure, pending conclusion of an FAA study of IFR operations with rotorcraft, which are otherwise certificated for VFR operations only. An approval under SFAR No. 29-2 may only be issued as part of that FAA study of rotorcraft IFR operations.

To assist in gathering data on SFAR 29-2 operations, the FAA has designed a questionnaire (FAA Form 8710-8) which will be completed by the appropriate FAA district office in cooperation with each SFAR 29-2 approved operator. Such data will be evaluated by the FAA as an aid in the further development of helicopter IFR certification criteria.

It is urged that all HAA operator members give serious consideration to the feasibility and possible advantages which may accrue to them by participating in the SFAR 29-2 program. This SFAR has been the result of intensive work over a significant period of time by the HAA in cooperation with the FAA, and I sincerely believe that it will be of considerable value to many of our members.

VC:mg

Vincent V. Colicci

Vincent V. Colicci
President

Appendix J

HELICOPTER ASSOCIATION of America

1156 15th St., N.W., Suite 610, Washington, D. C. 20005 (202) 466-2420 Telex 89615

September 25, 1979

TO: All HAA Regular, Associate and Sustaining Principals

FROM: Vincent Colicci, President

SUBJECT: Approval Procedures for Operations under Special Federal Aviation Regulation (SFAR) No. 29-2.

REFERENCE: My memorandum dated July 16, 1979, on the above subject.

Subsequent to the issuance of the referenced memorandum, the HAA received a number of inquiries about the intent of the FAA regarding stability augmentation for single pilot IFR operation (see paragraph (2) (e) on page 3 of my memorandum). Also questioned was the prohibition against single pilot IFR operation in a Terminal Control Area (see paragraph d. on page 2 of my memorandum).

As a consequence, representatives of the HAA met with appropriate officials of the FAA to discuss remedial action with respect to these two points. The FAA was extremely cooperative and responsive, and the agency has now issued a letter to its appropriate field personnel which supplements Notice 8710.2 (see the first paragraph of my memorandum) and provides interim guidelines until the Notice is revised. This letter states that the following guidelines should be observed:

"1. Single pilot operations will not be prohibited in Terminal Control Areas.

"2. For single pilot operation, a stability augmentation system and/or autopilot system that is capable of maintaining flight of the helicopter about the three axes is required. A two-axis (pitch and roll) SAS may be approved under this requirement provided the engineering evaluation conducted under the Notice establishes that the lateral-directional stability characteristics of the helicopter with SAS and the associated workload are satisfactory for single pilot IFR operation. The application must contain the make, model, and registration number of each helicopter in which a SAS and/or autopilot is installed, and make and model of each SAS and/or autopilot installed.

"3. Each PIC will be required to complete an initial instrument competency check in each type rotorcraft authorized, and subsequent 6-month instrument checks in at least one of the rotorcraft in which he is authorized to operate under the SFAR.

" The PIC using compensating features, such as a SAS or autopilot in lieu of an SIC, must show, during the required instrument check, that he/she is able (without a second in command) both with and without using the autopilot/SAS to:

a. Conduct instrument operations competently; and

b. Properly conduct air-ground communications and comply with complex air traffic control instructions.

Each person taking the autopilot/SAS check must show that while using the autopilot/SAS the aircraft is operated as proficiently as it would be if a second in command were present to handle air-ground communications and copy air traffic instructions. This demonstration must be accomplished each 6 calendar months. Initial and recurrent instrument competency checks conducted by FAA inspectors or designated company check pilots under Part 135 are acceptable to meet the instrument competency check requirements of this paragraph. The instrument competency checks, for those operations not conducted under Part 135, must be conducted by FAA inspectors.

"4. The letter of approval shall contain the provisions of this paragraph. Each pilot crewmember must have in their personal possession a letter of competency issued by an FAA inspector or authorized check pilot. Each pilot will conduct only those types of instrument approaches authorized by the letter of competency."

I trust that our members will find this supplemental instruction by the FAA to be helpful in obtaining single pilot IFR authorization where such type of operation will be beneficial.

VC:mg

Vincent V. Colicci

Vincent V. Colicci
President

Eastern Region Helicopter Council

The Council has been advised by the FAA that the following amendments to the Northeast Helicopter Corridor RNAV approaches are now in effect. In accordance with the council policies these changes will be accomplished as pen and ink changes, until such time as reprinting is deemed necessary.

The changes are as follows:

Washington, DC	Copter RNAV 184	MAWP named CHUMI; delete the depicted VFR route to the airport.
New York City, NY	Copter RNAV 271	MAWP named TEVEE
New York City, NY	Copter RNAV 241	MAWP named DEELR
Philadelphia, PA	Copter RNAV 070	MAWP named MODENA
Philadelphia, PA	Copter RNAV 229	MAWP named CROMM
Baltimore, MD	Copter RNAV 205	MAWP named MORRE
Providence, RI	Copter RNAV 089	MAWP named LAFER
Beverly, MA	Copter RNAV 080	MAWP named SYLVA
Boston, MA	Copter RNAV 064	MAWP named SEALE
Bedford, MA	Copter RNAV 028	MAWP named SLIMM
Hartford, CT	Copter RNAV 022	MAWP named LEDGER

Any questions pertaining to these charts can be addressed to me at 302-322-7336/7321.

Craig P. Wheel
Custodian of Charts

EASTERN REGION HELICOPTER COUNCIL

May 15, 1980

Mr. Glen A. Gilbert
H.A.A.
1156 15th Street, NW
Suite 610
Washington, DC 20005

Dear Mr. Gilbert:

The following changes should be made to the Northeast Helicopter En Route Charts:

Riverhead VOR (RVH) - Change name to Calverton (CCC) - 117.2

W/P Changes Affected by Relocating of Calverton:

W/P	FREQ.	AZIMUTH	DISTANCE
MAUDE	117.2	279.0°	25.0
FLOPP	117.2	312.0°	15.8
IGORR	117.2	344.0°	20.1
MUSIK	117.2	357.0°	12.9

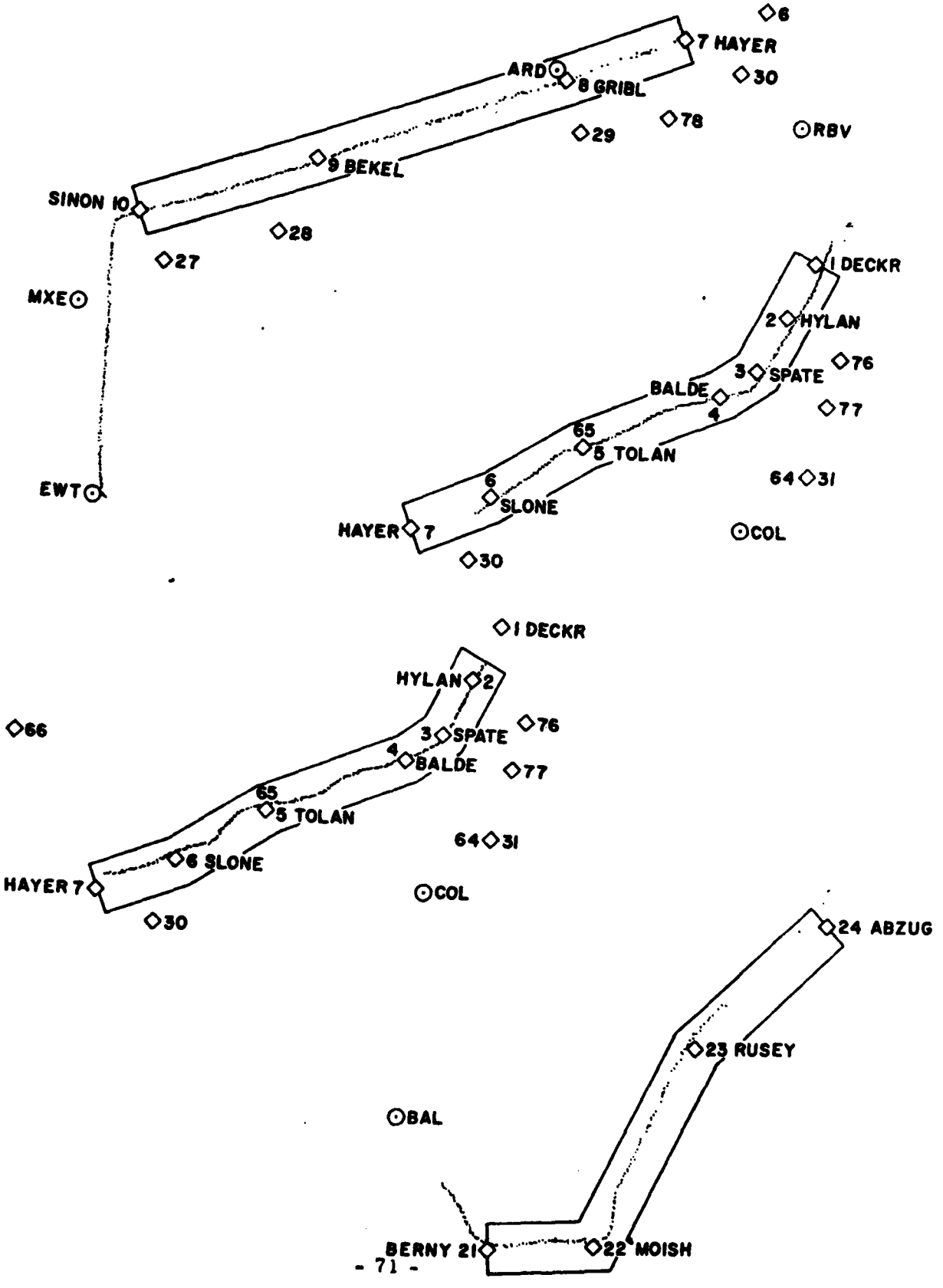
Very truly yours,

Craig P. Wheel/jm

Craig P. Wheel
Custodian of Charts

CPW:jm

Appendix L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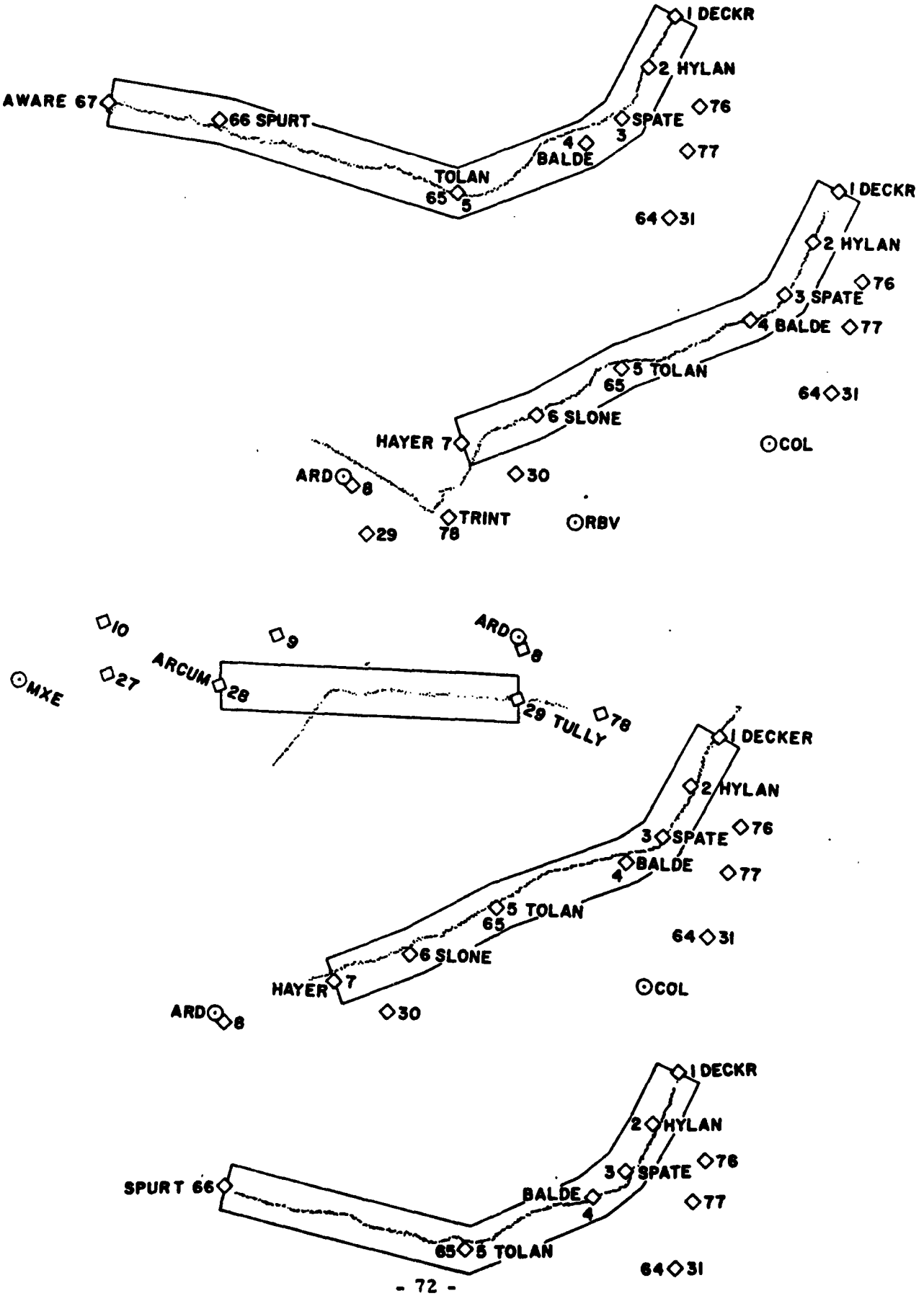
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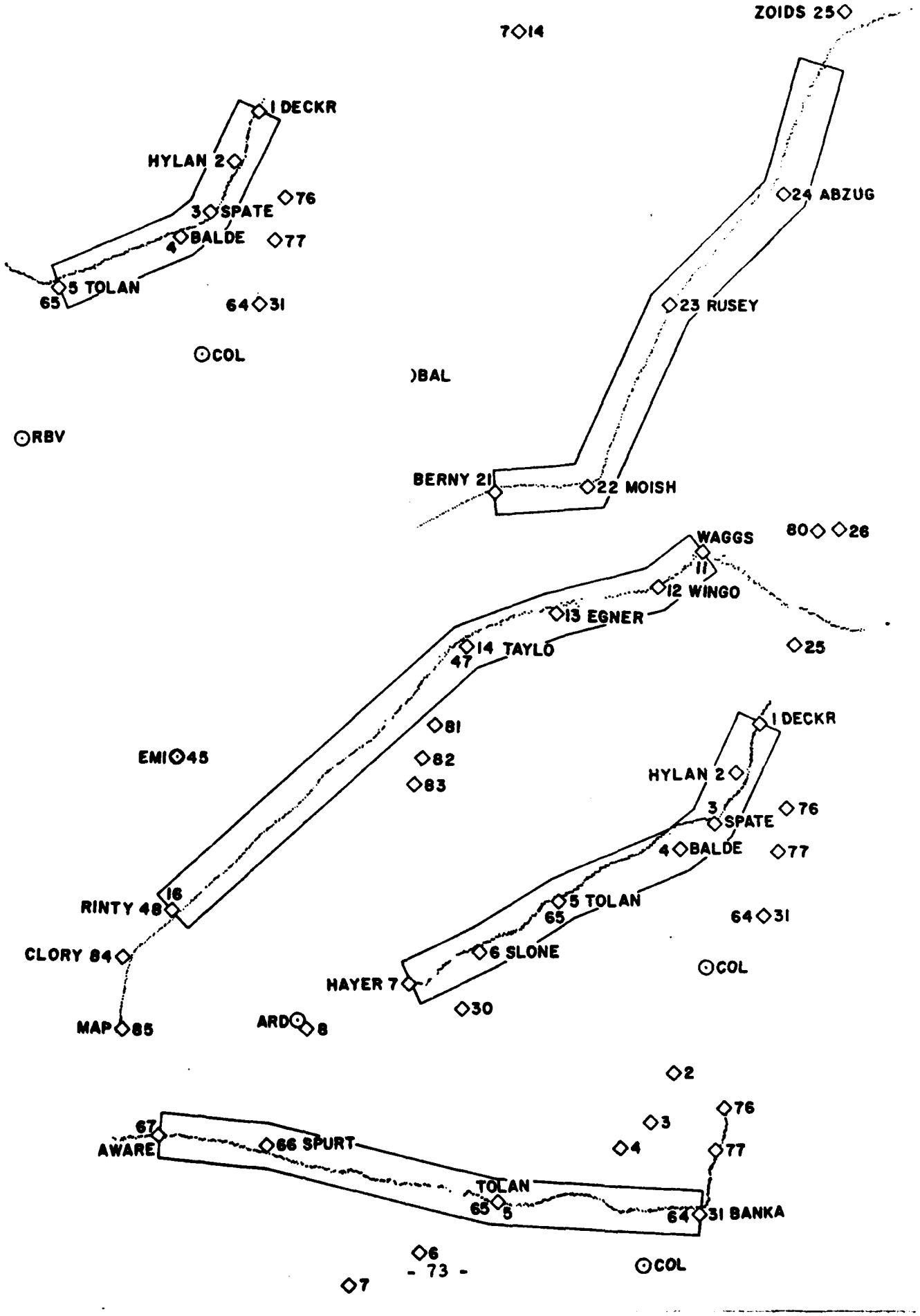
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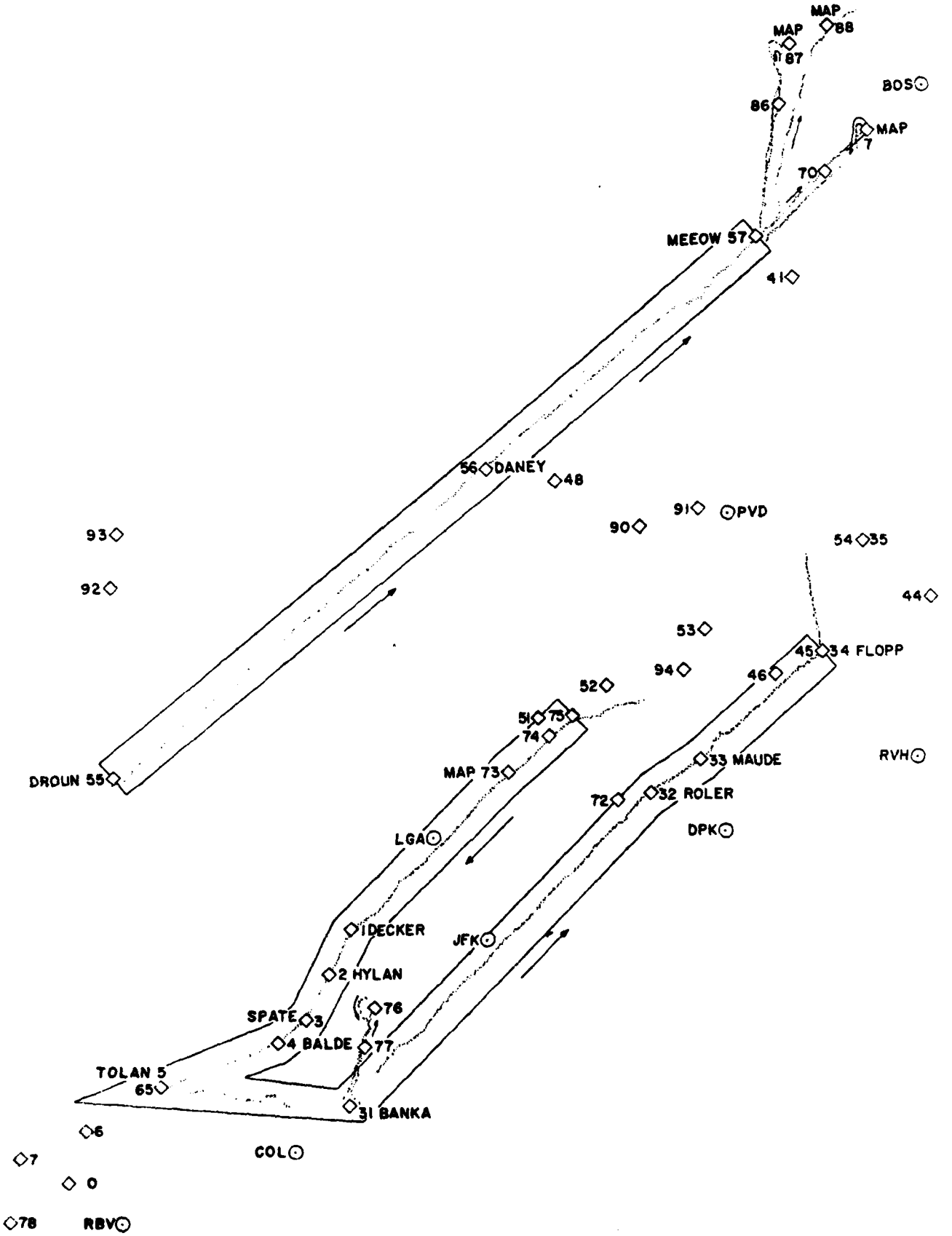
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34 FLOPP
94
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51
75
74
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RVH
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DPK
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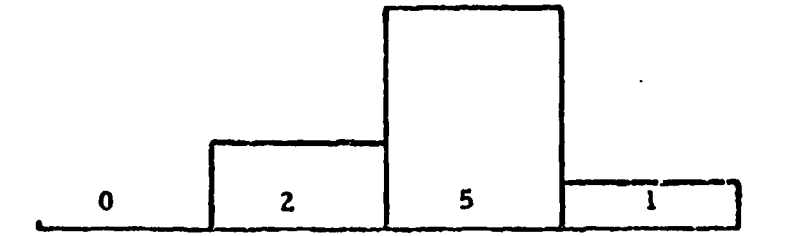
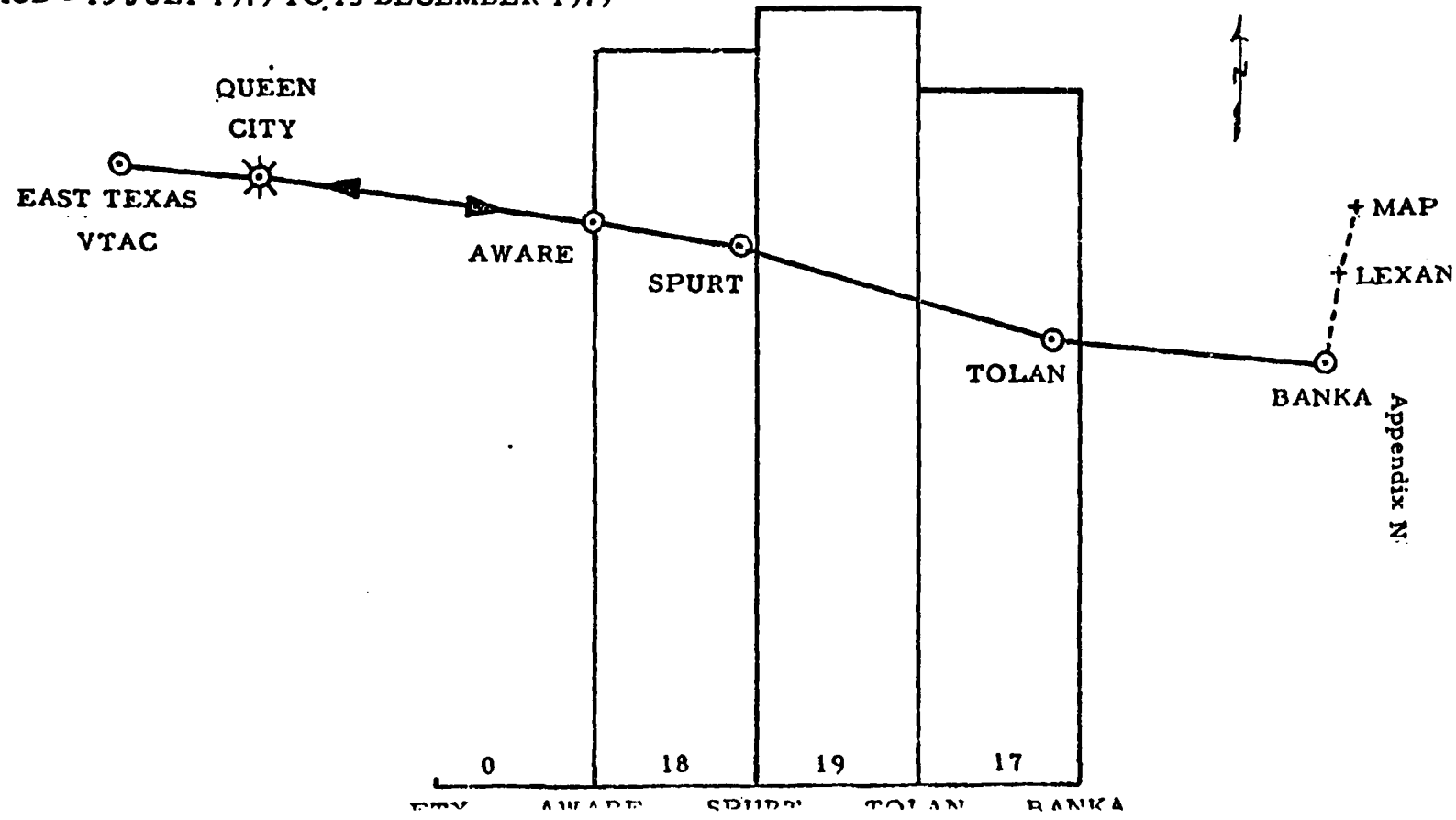


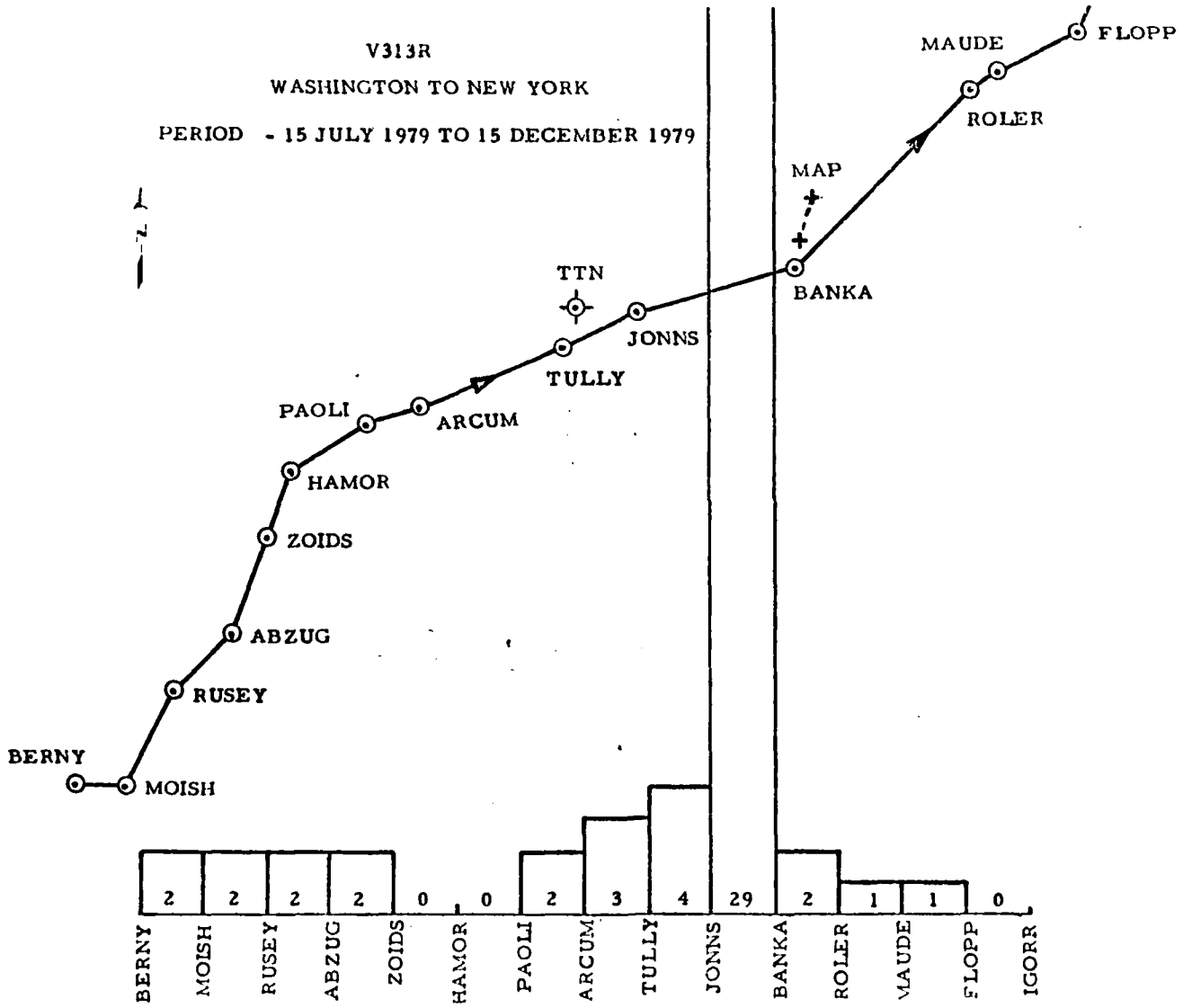
TWO WAY ROUTE

ALLENTOWN- NEW YORK - ALLENTOWN

PERIOD - 15 JULY 1979 TO 15 DECEMBER 1979



Appendix N


V313R
WASHINGTON TO NEW YORK
PERIOD - 15 JULY 1979 TO 15 DECEMBER 1979
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ABZUG
ZOIDS
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ARCUM
TULLY
JONNS
TTN
BANKA
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ROLER
MAUDE
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2 2 2 2 0 0 2 3 4 29 2 1 1 0
BERNY MOISH RUSEY ABZUG ZOIDS HAMOR PAOLI ARCUM TULLY JONNS BANKA ROLER MAUDE FLOPP IGORR